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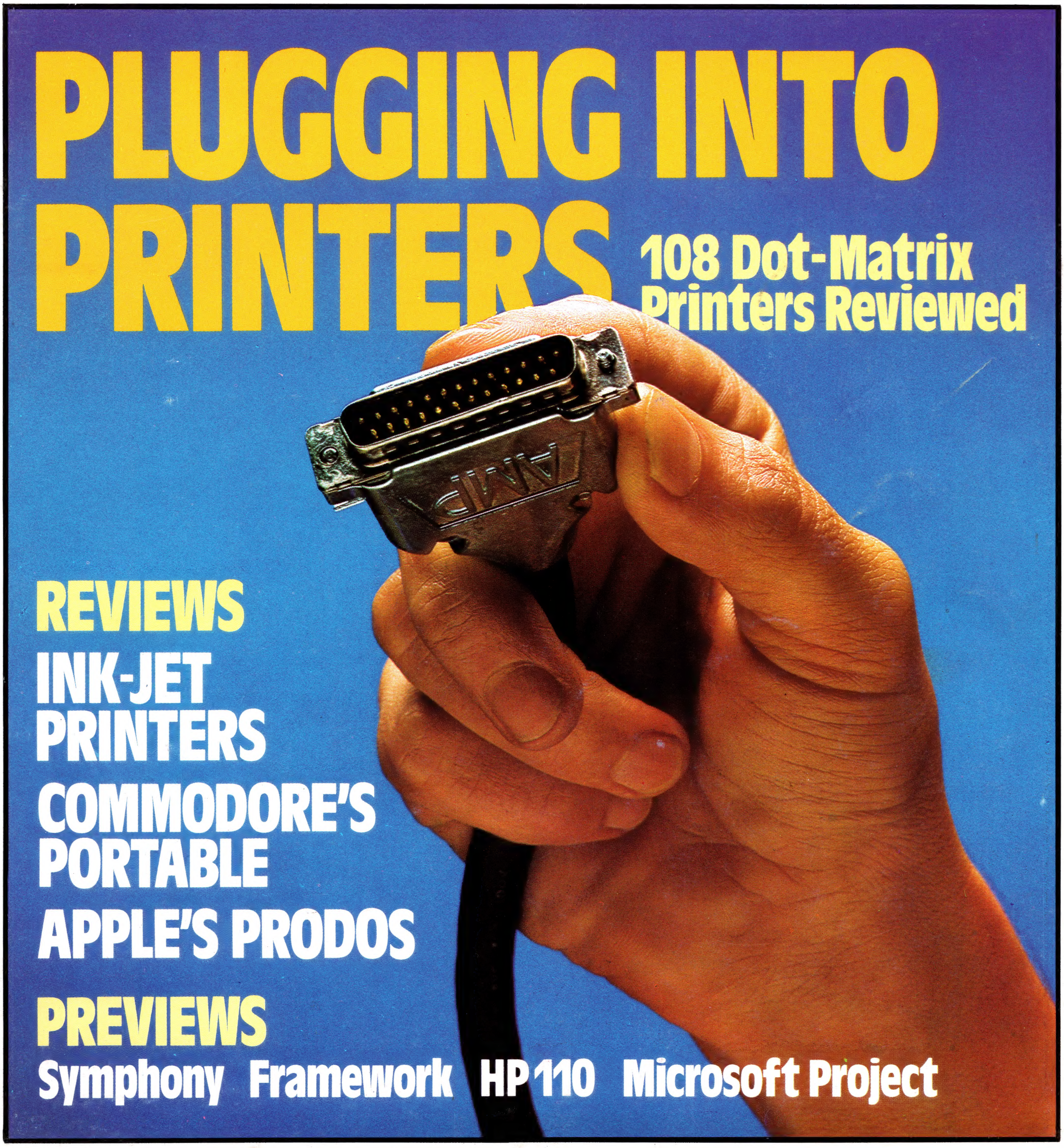

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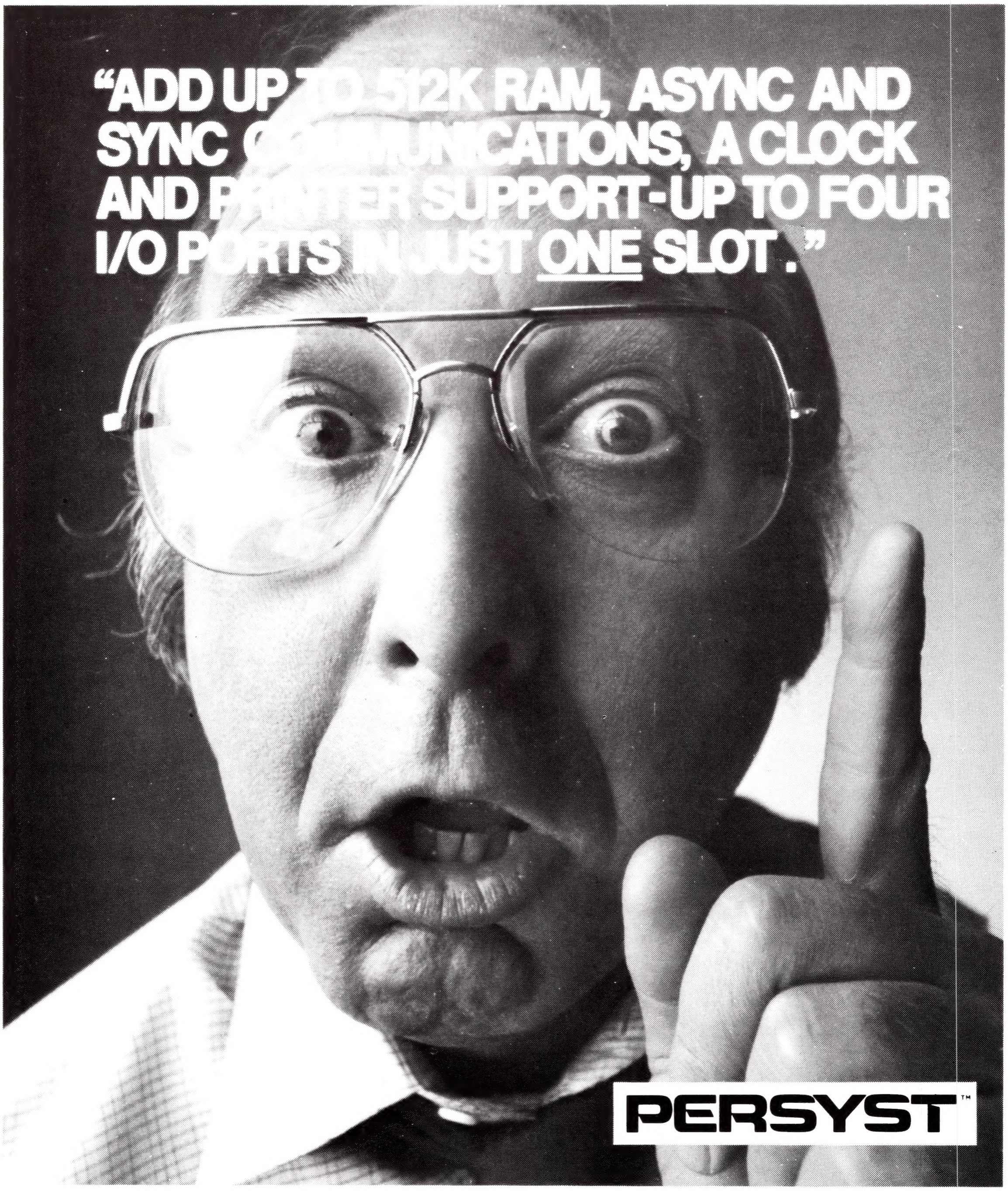
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INDEX

NEWS

4 **News Highlights**
Software has Day in Court
Imagineering lands Lotus
Dick Smith re-enters Mainstream
More Power for dBase
Draft Paper Backs 'Information'
Network Enthusiasm
Ansett's Flight Fright

8 **Perth Show a Great Success**

10 **Heavyweight Boxer**

12 **Mac Software — Later Than Late**

14 **News Highlights**
School Software
Dulmont's Big Deal
IMS Expands
Newtech Takes on Rampac
Executive Shuffle
Asian PC
DOS Handles Four Jobs at Once

17 **World News**
16-bit Commodore
Lotus AI Opts Out
No More Apple
Osborne Falls In
Peddle Power
Tandy Protection
IBM's School Thrust
Apple Avalanche
Atari Lay-offs
Wicat Teachers
Robot Wars
Kay Goes to Apple

OPINION

23 **Comment: Ian Webster**
If we say it's neutral . . .

24 **Comment: Doug Clapp**
Death of the user

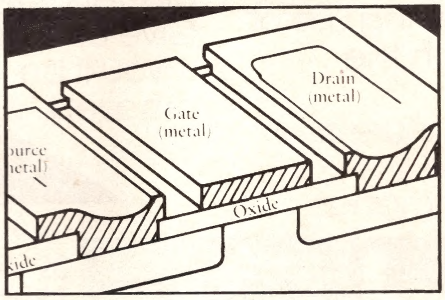
25 **Comment: Norman Kemp**
And another micro story

26 **Comment: Dvorak**
Did they use an axe?

28 **Letters to the Editor**

STATE OF THE ART

32 **Cool Chips**
New advances point to CMOS as the next step in the evolution of the integrated circuit. Howard Dicken and Robert Lunn investigate the technology.



REVIEW

39 **Previewing Products**
The gap between the announcement and appearance of products in Australia seems to be getting longer. We preview products yet to be released here.

48 **Because Commodore's Keeping up With . . .**
Ian Webster looks at the wide range of software available for the Commodore 64 and SX.

55 **ProDOS: By DOS out of SOS**
Apple's release of ProDOS for the Apple II is a great leap forward. Peter Watson says try it.

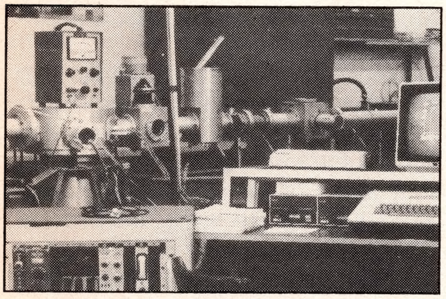
62 **Pumping Ink**
The enormous demand for printers and interest in color printing is encouraging ink-jet printer manufacturers. Janette Martin looks at the progress.

71 **Six Ink-Jet Options**
Tony Smith describes six ink-jet printers available in Australia.

76 **Which Printer?**
Neville Angove, Ian Robinson and Tony Smith look at 108 dot-matrix printers available in Australia.

APPLICATION

114 Experimental Control
Personal computers have found extensive application as real time control and data-collector systems in scientific laboratories. Bob Dalglish explains the theory and practice.



THE
'WIN APPLE'S MAC'
WINNER IS . . .

ON PAGE 30

COMMUNITY

122 Data 84
Ian Webster considers whether the Data shows can survive the microcomputer.

124 AutoMach 84
Real robots don't hang out at business computers shows — they are too busy earning their keep in factories and warehouses. Ian Robinson investigates.

127 Corresponding with Computers
The Sydney Correspondence School has pioneered the use of networked microcomputers to serve administrative and teaching staff. Grahame Humphrey describes this system.

DEPARTMENTS

136 Systems
139 Peripherals
142 Communications
144 Software
146 Education
147 Industry
150 Applications
151 Microware

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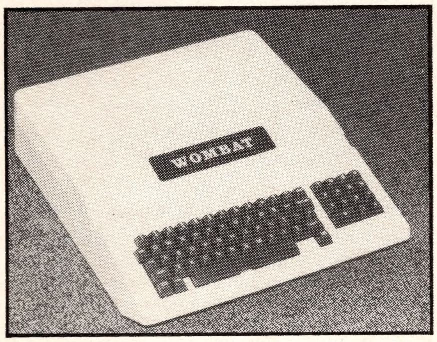
SOFTWARE HAS DAY IN COURT

THE past three months have been very important for the local microcomputer industry as it has successfully developed the confidence, contacts and skill to argue for its interests in the public arena.

After the Attorney-General's seminar in May and the World Intellectual Property Organisation conference in April, the three federal ministers responsible for the issue, Jones, Evans and Button, made a commitment to present legislation during the current sitting of Parliament to clarify the protection accorded software under the Copyright Act. Notice of motion for leave to introduce a Copyright Amendment Bill was given on May 10 for introduction when Parliament resumed on May 29. The legislation takes the Option A outline by the Attorney-General's department before the copyright seminar.



Computer software will be specifically included in the existing category of literary works with additional amendments to clarify the nature and scope of the protection with regard to the distinctive features of computer software.

Notice was given that the legislation might not proceed if the Federal Full Court appeal in the Apple vs Computer Edge case resolved the matter in such a way as to avoid the need for legislation. The proposed legislation was also seen as a short-term measure and would not pre-empt consideration of the fundamental issues, particularly with regard to work stored in or created with the aid of computers.

The announcement of legislation was greeted with enthusiasm by the computer industry, particularly the microcomputer software group of the Australian Computing Services Association, chaired by Imagineering managing director Jodee Rich, who claimed the decision would result in the release of many new products onto the local market.

Prominent opponents of copyright legislation, Software Liberation, seemed surprised by the decision to legislate. Spokesman Albert Langer was satisfied that the coalition of legal and academic opponents that emerged at the Attorney-General's seminar and the lack of action at the WIPO conference would stop any hasty action.

All sides of the debate were stunned when the appeal by Apple was upheld in the Federal Court on May 29 — just as the legislation was to have been introduced that night. The Federal Court, in a unanimous decision, ruled that computer software source programs were literary works under the meaning of the Copyright Act, saying "there is no necessity for a literary work to have to be of any literary quality . . . One limit, doubtless, is that it needs to be a work and to have had some skill, even if very small, applied to its preparation." In a 2-to-1 decision, the court ruled that computer program object code should be regarded as an adaptation of a literary work.

A unanimous decision also ruled that Computer Edge had infringed the Trade Practices Act in selling the Apple compatible Wombat computer based on its use of Apple manuals for the machine. Apple Computer Australia was given the opportunity to sue Computer Edge for damages.

The government had decided to press ahead with the introduction of legislation despite the decision. Computer Edge has decided to appeal to the Supreme Court.

IMAGINEERING LANDS LOTUS

LOTUS Development Corp, which developed the integrated spreadsheet Lotus 1-2-3, has appointed Imagineering as its sole distributor in Australia and New Zealand. Lotus has been besieged by Australian companies wanting to distribute its product and last year appointed Sourceware as its Australian distributor as an interim measure.

Lotus visited Australia in May to establish distribution before the release of Symphony, expected in July.

Several companies made submissions to Lotus, but the final choice was reported to have been between Sourceware and Imagineering. Both companies lobbied hard, with Sourceware standing on its reputation for support and Imagineering on its domination of software distribution in Australia.

Lotus preferred the financial and distribution strength of Imagineering, but is reported to have insisted on a substantial support agreement that will see Imagineering spend $200,000 on advertising and provide a five-person support team for Lotus and Symphony. Sourceware will continue to act as the only subdistributor. Imagineering will also try to stem the import of Lotus from US wholesale distributors and the illegal copying of the program.

DICK SMITH RE-ENTERS MAINSTREAM

DICK Smith Electronics has re-entered the mainstream microcomputer market. After some success with the Exidy Sorceror and the System 80, Australia's largest chain of electronics stores has concentrated on the bottom end of the

Dick Smith CAT: aimed at education and home.

market with the Wizard, Vic 20 and VZ 200.

The company has released two new computer systems, an Apple compatible and an IBM PC compatible and has upgraded the computer section of its electronics stores by establishing Computer City centres. These centres will offer an alternative to department stores and computer dealers.

The Apple compatible Dick Smith CAT is manufactured in Hong Kong and is sold around the world as the Laxer. It is built to the Apple *II's* specifications and is claimed to be able to use most Apple *II* software although it cannot use any Apple peripheral hardware.

Priced at $695, it uses ULSI extensively to achieve reliable operation and low cost which has been a problem with many other Apple-compatible computers. The computer will be marketed aggressively against the Apple *IIe* and Microbee and should do well against both as well as other Apple-compatible computers. Apple's release of the Apple *IIc* will, however, increasingly distance the company from the compatible computers.

The CAT will be marketed to education with Dick Smith announcing a Computer Educator of The Year award and the donation of $70,000 worth of CATs to the NSW Independent Schools Association. A recent company press release reopens the controversy surrounding the previous NSW Education Department's computer tender.

After accusations that the Microbee did not meet the specifications of the department's infamous tender document, the Premier, Neville Wran, instigated a committee of inquiry. The results of the inquiry were not released.

Dick Smith Electronics claims that the department has continued to select machines that do not meet its specifications, and draws attention to the department's practice of putting equipment still being developed on to the contract list.

The second machine released is the Dick Smith Challenger, an IBM PC compatible manufactured by UK company Ferranti. The machine is still in short supply because of UK demand and the redesigning of the case. But priced at $2990 for a 256K-byte dual disk drive system, the machine is expected to do well in the cost-conscious Australian market.

MORE POWER FOR dBASE

ASHTON-Tate has followed up its best-selling dBase II database management program with dBase III, a product the company says is much easier to use and more powerful than its predecessor.

Priced at $US695, the product was expected to be shipped to dealers on June 14, and available locally in July says Australian distributor Arcom Pacific.

Unlike dBase II, which is an 8-bit program, dBase III is designed to take advantage of Intel's 16-bit 8088 chip. The new program is compatible with IBM's PC-XT systems and their lookalikes.

Ashton-Tate says it will not replace dBase II with dBase III, because it expects dBase II to continue selling well in the 8-bit marketplace.

Enchancements made to boost dBase III's power include: the capability to open 10 databases at the same time, compared with dBase II's limit of two; storage capacity of up to two billion records per database, compared with dBase II's 65,000 capacity; record capacity to hold up to 4000 bytes, an increase of 2976 over dBase II's limit; up to 128 fields per record, an increase from dBase II's 32; and accommodation of variable length text fields, unlike the fixed text fields of most databases.

The company has made the product easier to use than dBase II by adding a command assistance mode.

Like dBase II, dBase III has its own programming language, enabling customers to create their own vertical applications to manipulate stored data. Unlike dBase II, however, dBase III was programmed in the C language, so it can "accommodate the next generation of hardware."

To make dBase II programs compatible with dBase III, users will need a set of utility programs to convert their files to fit the new product's format.

A multi-user version of dBase II is expected to be released soon.

DRAFT PAPER BACKS 'INFORMATION'

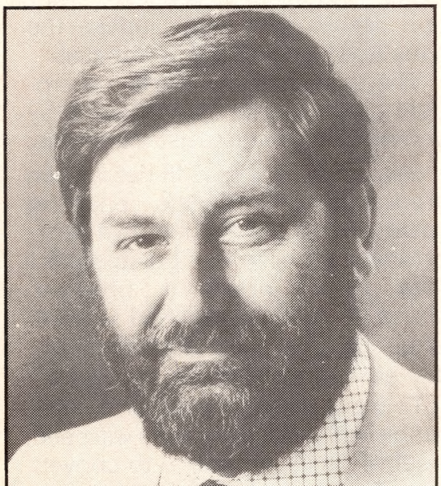
THE Federal government has released its discussion draft National Technology Strategy paper, outlining government, industry and union initiatives needed to achieve viable information technology in Australia.

The paper, released by the Department of Science and Technology, attempts to treat the emerging and unproven technologies even-handedly, but a few short, substantive points establish the primacy of information technology.

One policy principle, for example, says: "The application of key technologies and, in particular, information technology, throughout the Australian economy will be the most important source of long-term growth and job creation."

The paper also indicates that the Minister for Science and Technology, Barry Jones, has softened his original, widely quoted view that Australia had missed the opportunity to build a viable computer hardware industry.

The Department of Science and Technology now realises that the information sector of the economy is a strong employer and wealth generator. The paper also considers information technology is vital to the competitive viability of a range of industries and fundamental to the next generation of technological change — technologies that build on technologies.



Barry Jones: softer line.

The draft paper, an upshot of last year's National Technology Conference, also indicates that the department's information technology section is trying to generate initiatives for information-using industries, giving them the public service support which, until now, has generally been the sole province of farmers and miners.

The section's public awareness and demonstration programs are growing from their roots in Information Technology Week/Month and Smarter Office-Stronger Firm through its participation in the Royal Melbourne Institute of Technology's Australian Microcomputer Industry Clearinghouse and a similar facility which is scheduled to open in Adelaide later in the year.

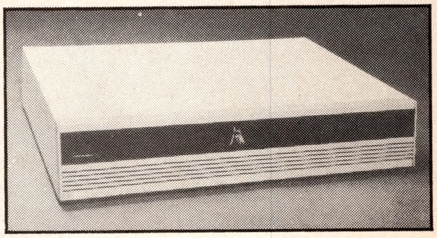
Making information technology and computers even more synomymous, the section was recently made responsible for promoting the use of micro-electronic technology both in manufacturing processes and end products. To this end, it is supporting the opening of the first micro-electronic application centre at RMIT this month.

Evolution of the paper into government policy is expected to give Science and Technology a brief to double its efforts to support local hardware and software industries. It will also promote the use of information technology in all industry.

NETWORKING ENTHUSIASM

MICROCOMPUTER distributors and dealers are taking a great interest in networking.

Horizon has acquired distribution rights to the popular Corvus Omninet network and range of hard disks previously held by Electronic Concepts. Imagineering has distribution of the Ethernet-based 3COM network, while Software Corp of Australia has released 10-Net with networking database software for IBM PC. O'Reilly Computers is distributing the Nestar network and Hisoft is about to announce an IBM PC network.



Adler file server.

With the exception of Omninet, these networks do not allow different brands of micrcomputer to be networked.

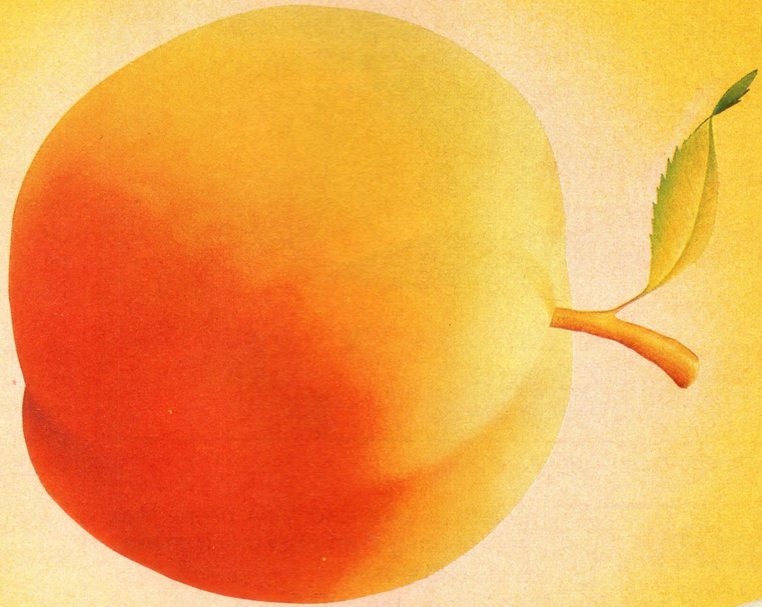
Adler has introduced a file server, supporting many different microcomputers with a low-speed network that provides access to a hard disk ranging in capacity from 10 to 85M-bytes. A streaming tape backup system is available for the file server.

ANSETT'S FLIGHT FRIGHT

PASSENGERS on Ansett flights have been advised not to use portable computers on aircraft. The decision was made after several US airlines reported that personal computers had interfered with navigation systems and other onboard computer equipment.

An Ansett spokesman said the company would not ban the use of computers. But as each Boeing 767 has 110 microprocessors on the flight deck, each with the potential for being interfered with, the company would continue to give the advice until the US claims could be checked.

Going for gold...



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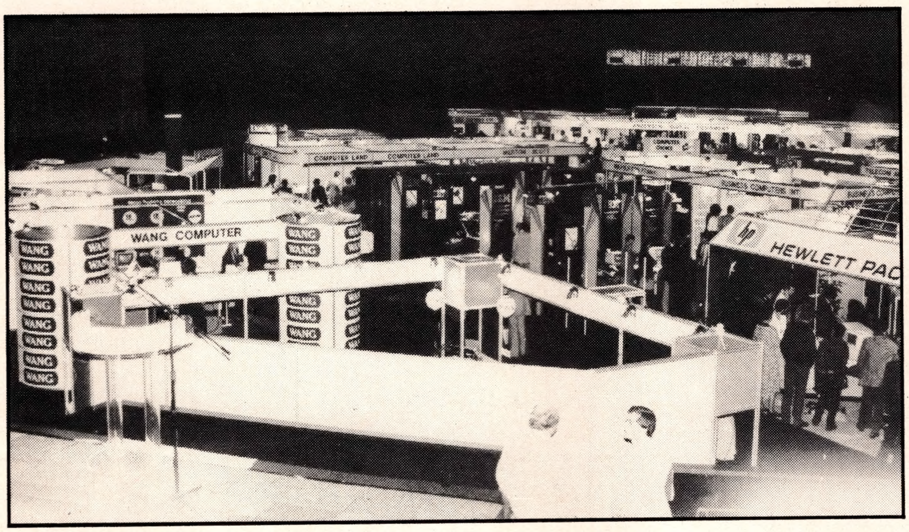

The crowded floor of Perth's Computer 84.

PERTH SHOW A GREAT SUCCESS

PERTH leapt into the microcomputer age with one of the most successful micro exhibitions ever staged in Australia, an event that overlapped with the ambitiously titled International Microcomputer Conference '84.

Computer 84, held over three days in late May, filled much of Perth's Entertainment Centre, with 45 stands representing a mixture of national suppliers, local distributors and specialised local companies.

A total of 4700 exhibition visitors was registered on the first three business days — exhibitors were impressed by the quality of the leads they obtained — followed by more than 2500 on the shortened final public day.

Considering the State population, the attendance compares favorably with the highly rated personal computer shows in Sydney, which were open to the public throughout.

The general standard of the exhibition, including security arrangements, was completely satisfactory — but this did not prevent the overnight theft of an Apple Macintosh complete with 110-volt transformer from the stand of leading local Apple dealer Computer Choice.

Fortunately, the dealer, who was the only Apple representative there to satisfy the stream of enquiries of potential Lisa and Mac users, was able to bring in another unit from one of its two stores.

IBM, on the other hand, turned up in force with a System 36 mini, the usual PCs and XTs, one of the first public showings of the long-awaited 3270/PC multi-windowing unit, and a live Charlie Chaplin imitator.

Perth's large number of IBM dealers were also prominent, with Stott & Hoare scoring something of a coup, displaying not only a borrowed portable PC which had been brought into the country privately but also the PCjr, which is yet to be released in Australia.

Stand-of-the-show award was given to Sperry, which had air-freighted its display in from the east at the last minute.

Perth otherwise retained its reputation as the pirate capital, being so far away from mainstream computer supplier head offices that the most blatant pre-Beaumont pirate company, Software For All, openly ran a stand (with mainly Commodore software).

The only other real attractions for home computer enthusiasts were Applied Technology, which has strong WA government support for Microbees in schools; and Dick Smith, which gave away one of its "Apple-eating" Cats and virtually threw away VZ-100s at the show special price of $99.

The exhibition is certain to become an annual event, but the accompanying conference which started it all did not produce the kind of returns needed to guarantee a repeat before 1986.

The conference was organised by and conducted at Western Australian Institute of Technology, which found itself caught in a conflict between the demands of the potential new computer users — which it claimed to be aimed at — and its natural propensity to organise an academic-style conference.

The multiple stream three-day conference, 13km from the city exhibition, did not attract enough curious members of the public, and the meeting therefore largely became an exercise of preaching to the converted: the many excellent papers attracted an average attendance of around 20 per session.

However, the conference opening at the Sheraton Hotel was a more inspiring affair, with visionary addresses from Institute director Dr Don Watts and invited keynote speaker Dr Jack Nilles, director of the Information Technology program at the Centre for Futures Research, University of Southern California.

And after the cancellation of an address by former Australian Computer Society president Ashley Goldsworthy, an excellent second keynote presentation on the technology used by Australia II's navigator Greg Simmer on the successful America's Cup challenge developed from what had seemed, at first, a very parochial subject.

Clashes with Data 84 in Sydney and another computer exhibition in Singapore may have kept down the number of experts from the eastern States and South-east Asia, as well as suppliers — and even slightly thinned the ranks of WA industry leaders. But the effect was not measurable at the exhibition and was not as serious as the problems of an appropriate format for the accompanying conference sessions.

Despite the considerable financial loss from running the micro conference, the institute should have learned enough of the obvious lessons to put together a format with wider appeal in future.

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HEAVYWEIGHT BOXER

THE Computer Education Group of Victoria's sixth annual conference, held in the second week of May at Latrobe University, attracted about 450 delegates. This year the focus was turning from the computer hardware and software to how to effectively use it in the classroom, an indication that educational questions are becoming more important to teachers than how to press the buttons.

A tradition of the conference has been the presence of notable overseas computing educators, including Seymour Papert (MIT), Jim Howe (University of Edinburgh), David Moursund, (University of Oregon), David Squires (Chelsea College) and David Rawitch (Minnesota Educational Computing Consortium). This year, the keynote speaker was Hal Abelson from the Laboratory for Computer Science at MIT.

Abelson, a quiet, shy man, straddles both the teaching of computer science at MIT and school computing education in which his research interest has been Logo and its use as a tool in the school curriculum. His involvement with Logo goes back to its beginnings in the late 1960s. He now heads a research group grappling with the development of Boxer, an educational computer environment destined for possible commercial release at about the end of this decade.

MIT people are patient. Logo was developed in its present form by the mid-1970s, but could run only on minicomputers. It wasn't until the development of micros such as the Apple *II* and the Commodore 64, machines with 64K-bytes of memory, medium-resolution graphics and prices affordable by schools, that Logo became a marketable reality.

Abelson says early versions of Boxer are running on a Lisp personal computer with 8M-bytes. Boxer, when finally finished, will probably run on a machine about as powerful as Apple's Lisa with about 1 to 2M-bytes of memory, he says. They are banking on the likelihood that machines of about Lisa's power will be affordable for classroom use towards the end of the 1980s.

The MIT group, working first under Papert and now Abelson, has made an astonishing contribution to computing education. It has no formal existence other than as a small group within a large and prestigious university department. Its members are not teachers and have no actual role within the educational structure, yet they have been responsible for a significant idea that children can learn not by being taught by computer, but by teaching computers — a microworld in which bugs are not something terrible but paths to discovery and understanding.

In his keynote address, Abelson exploded the myth that Logo is a language for trivial problems. He talked about simple AI procedures in which turtles navigate themselves by "smell" to some goal or nose their way around the corners of a box looking for escape, problems accessible through Logo to lower high school children.

Hal Abelson

He talked about turtles that walk on spheres and how the rules of turtle geometry no longer hold and about the mathematical problems of a turtle walking on the edge of a cube. His dream is not that Logo will be taught in every classroom but that we will integrate this new technology into the curriculum of maths, science and the humanities. It will use the new technology, not simply create pencils, paper and textbooks in electronic form, a problem he sees with much of the educational software now available.

Abelson also answered (by way of a video demonstration) the question of where Logo goes in the longer term. Boxer is in the tradition of a Logo-like language with all the advantages of high-resolution screens that can handle window-driven software. Yet Boxer does not resemble any window software we have seen.

This longer-term view also begs the question of how much longer conventional 8-bit machines can be supported in the classroom. The debate raging in educational circles over whether one piece of 8-bit hardware is preferable to another is somewhat meaningless if one compares either of them with a machine like the Macintosh.

Abelson sees a unique opportunity for school systems to study what classrooms five and 10 years ahead might look like by undertaking experiments where large numbers of computers are placed within a small number of schools.

The MIT view of the student being exposed to some powerful ideas and taking an active part in his or her own learning also dominates their approach to computer-science education. Having turned computing in schools on its head, they are now tackling undergraduate education.

The starting point is not Pascal (a language they consider unsuitable for education) but Lisp. Students, in a first-year course, tackle the simulation of a computer processor and the development of a Lisp interpreter for it, as well as the development in Lisp of a logic programming Prolog-like language.

The rationale for this approach seems to be two-fold. First, the engineering of expert systems is in its infancy and graduates with this background will be in a position to make a significant contribution. Second, a major problem of computer science is the construction of very large programs, for which Pascal is unsuited because of its strong typing.

The Sirius business computer. To begin with, it has twice the brainpower of an IBM.

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Then there are some other practical points you may have missed. (After all, IBM did.)

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sirius

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*The IBM PC starts out with 64 K of user memory, upgradable to 544K, fully expanded. The Sirius starts out with 128 K and expands to 896 K.

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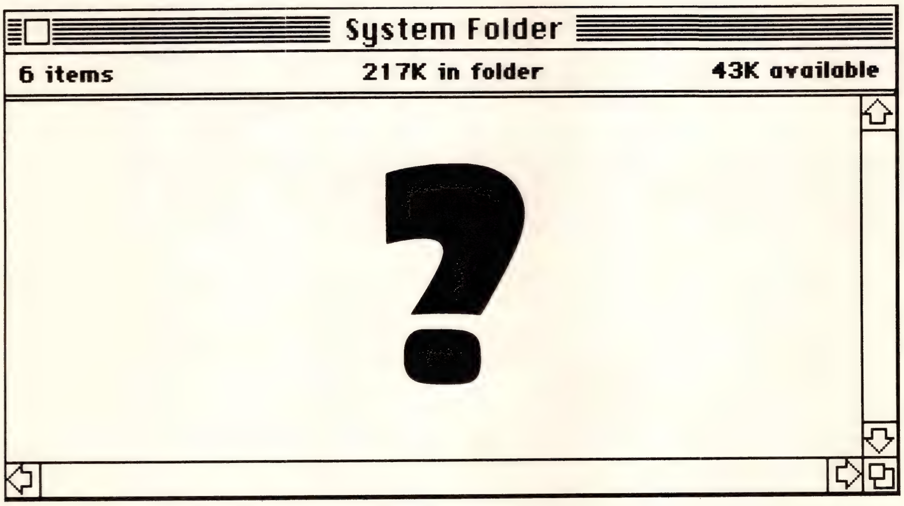


Mac Software — Later than Late

Software developers are still struggling with Macintosh's limited memory and its complex new operating environment.

IT is three months since Apple Computer released its Macintosh, and buyers are still waiting for one thing: software. Although developers are racing to produce their products for the machine, it is more of a marathon than a sprint.

Despite the great emphasis Apple placed on the first three months of the computer's sales, most developers who promised to deliver software for Apple's ballyhooed baby have yet to do so.

Apart from MacPaint and MacWrite, the two programs that Apple supplies free with the computer, and a few independently developed products, there is almost no software available for the Macintosh. Developers — and Apple itself — say it could by July, or even later, before consumers will be able to buy additional programs for the machine.

There are several elements at the root of the machine's software-supply problem; some are technical and some are business related. On the technical side, a new proprietary operating system, limited memory, and lack of sufficient programming languages and tools have presented difficulties to programmers. On the business side, some developers say they were coaxed — by both Apple and by an anxious press — into setting shipment dates they could not meet. Others waited to see whether the computer would sell as well as Apple predicted, and now face a delayed start that spells both late release of products and, potentially, a nearly saturated market for applications when the products are finally released.

"We were not pressured to announce an early date, but Apple clearly wanted people to understand there would be a lot of software for the Macintosh," says John Page, vice-president of software development for Software Publishing, of California. "That was predicted as one of the success factors of the machine. We were strongly encouraged to hurry. I would refer to it as 'intense cajoling'."

Volition Systems, a California developer of programming languages, says it was pressured to announce that it would ship its Modula-2 language by June this year. The pressure came from the computer press, not from Apple, says Joe Caporaletti, vice-president of marketing and sales. Volition now says it will ship the language in September.

Despite both prodding and advance technical support from Apple, virtually every program promised for the Macintosh is well behind schedule. But Apple maintains that the software is coming.

"We still feel about 150 programs will be available for Macintosh this year," an Apple spokesperson says.

"We probably get 75 calls a day from programmers who want to be part of our Certified Developer program. We've placed more than 1000 systems with developers."

Apple itself is late in getting its promised Macintosh software out the door. MacTerminal, a $US99 communications package that will let the Mac send and receive files at up to 19,200 baud and allow the computer to behave like Dec's popular VT-100 and VT-52 terminals, is three months late. It was originally scheduled to be delivered in the first quarter of this year; Apple now says the delivery date will most likely be in July.

At Apple's April 24 introduction of the Apple *II*c, company officials admitted that the Mac's applications programs would not be on the shelves until at least September. Programming languages, the lack of which has hampered some developers, will probably not be available until July.

A version of the Pascal language is due in June, while an assembly language and debugger are slated for release in July. The Basic language and Macintosh Logo with turtle graphics won't be out until September.

MacDraw, a version of the LisaDraw graphics editor that helps prepare presentation graphics and blueprints, will not be released until September, according to Apple. It will retail for $US125. MacProject, another $US125 program being adapted from an earlier Lisa version, will also not be available until September. The program will allow owners to create a PERT (program evaluation and review technique) chart for planning and managing large-scale projects.

Even Microsoft, the independent software developer most closely associated with the development of the Macintosh, has fallen behind in its production of applications for the machine. The company's spreadsheet package, Multiplan, was the only application Microsoft released with the Macintosh. That product turned out to be faulty, and is being recalled.

We were not pressured to announce an early date, but Apple clearly wanted people to understand there would be a lot of software for the Macintosh.

A batch of other promised software still "in the kitchen" includes Microsoft Word, a Macintosh version of the company's IBM PC word processor that uses a mouse, windows, and pull-down menus. According to Microsoft's product marketing manager, Jeff Raikes, Word will be out near the end of June, three months later than originally expected. The same schedule holds for Microsoft File, a "nonprocedural tool" that lets users maintain their personal files.

Despite these delays, Raikes says that developing software for the Macintosh is easy. "Mac is easy because much of the user interface capability — pull-down menus, the management of windows, the key user-interface routines — are provided within the machine," he says. "Typically, a software developer would have to write his own routines. In the case of the Mac, a lot of that code is provided for the software developer already. That's why it's easier for software developers to write software for the Mac."

Living Videotex, the California developer of the Think Tank program, found some of the same problems as Software Publishing.

"It's been tough in that we realised we would not be able to fit our entire product in the 128K-bytes of memory. We couldn't go for full functionality," president Dave Winer says. "The full Think Tank will be offered probably at the end of the year when the Macintosh has more memory. The mouse is a real winner, but it took us two or three months to figure out how to make it win. It took us a good eight months to get to where working with the Mac is easy."

Volition Systems says it also found the 128K-byte memory limitation a tight fit for its product, although that obstacle has been surmounted. But Caporaletti says the company's programmers needed several months to become familiar with the Macintosh — and Apple's $US105 software-developer's manual called Inside Macintosh — to speed product development.

"The (Inside Macintosh) manual is 800 pages long, and it's a complicated toolbox," he says. "It took quite a while reading the manual to ascertain how to use the system. It's not a run-of-the-mill operating system. It's a new software technology."

Other developers have run into some delays because of the lack of needed software tools. Despite Apple's toolkit and the availability of some products that developers need, there are still some tools that programmers can't get. Main Street Software, whose Main Street Filer database is one of the few programs already available for the Macintosh, needed one particular tool that still hasn't made it out of Apple's back room.

"We wrote a translator to port our program over," says Tony Roumell, director of sales and marketing for Main Street. "A C compiler wasn't forthcoming from anybody. We needed software tools, and Apple gave us what they had, but they didn't have what we needed. So we sat on their doorstep. They have a C compiler everybody is waiting for, but they keep finding problems with it. They are just not releasing it until it's really there and solid and developers could take it."

Developers remain optimistic about the success of the Macintosh — and their own software — despite the delays facing Macintosh owners who want to buy applications for the machine. Developers who have released software already, or will release it soon, claim demand is strong.

Release Dates for Selected Macintosh Applications

Product Name	Publisher	Dates
Chart	Microsoft	May
File	Microsoft	June
Habadex	Haba Systems	May
Helix	Odesta	June
Logo	Apple	September
MacDraw	Apple	September
MacProject	Apple	September
MacTerminal	Apple	July
NPL	Desktop Software	November
PFS:File	Software Publishing	summer
Spreadsheet Link	Dow Jones	May
Think Tank	Living Videotex	June
Word	Microsoft	June

SCHOOL SOFTWARE

A NEWLY formed software company has won $1 million in venture capital and the patronage of the Victorian government in a plan to write educational software.

The equity partners in Prologic Pty Ltd are Control Data Australia Pty Ltd (15 per cent), book publishers Longman Cheshire Pty Ltd (10 per cent), the Victorian Economic Development Corp (10 per cent) and the principals Dov Brenner and Tim James, both ex-Control Data and ex-Computer Power (65 per cent).

Prologic will write educational software for schools. As evidence of the government's commitment to the venture, school teachers are being seconded to Prologic for periods of a year each to design and write courseware.

Three teachers selected from 30 suggested by the department have started training. Up to 15 may eventually be seconded to Prologic.

There would be 15 to 20 authors within a year, although not all would be teachers, but freelance writers. A target of 700 lessons to be developed in three years has been set for primary and post primary.

"We wanted to raise a lot of money to set it up properly," Brenner said. "Even without the management investment companies, you can raise money if you have a good idea and a substantial business plan."

Nine months had been spent preparing the business before it began, he said.

There are 2700 schools in Victoria, 900 of which already have computers. "In many cases, schools buy them and then don't know what to do with them," Brenner said. "There's no doubt there is a lack of quality courseware.

"The market is very much in our hands. There are no buying guarantees but there are the links with the Education Department."

There was already interest from two other States and the multinational partners would act as distributors overseas.

The machines selected for the venture are Apple, Commodore 64, the IBM PC family and the BBC.

The courseware will be developed using Micro Plato and a similar language developed by Prologic that supports frame-based graphics and courseware.

DULMONT'S BIG DEAL

LOCAL portable computer manufacturer Dulmont has signed a $US1.5 million contract for the supply of 1000 Magnum computers to an unnamed American company. The contract is the work of Dulmont's globetrotting marketing manager who has attended most of the world's computer shows in the past six months.

The contract has been signed by Hong Kong company Omtis, which has worldwide marketing rights for the Magnum and is a shareholder in Dulmont.

Meanwhile, President Computers, which is handling distribution of the Magnum in Australia, has become distributor for another Z80A-based briefcase portable. The Roadrunner features an 8x80 LCD display and four cartridge slots that can accept battery-backed RAM cartridges to 64K-bytes and Basic, SuperCalc, Editor, Scheduler and terminal software in ROM cartridge. The Roadrunner weighs 2.4kg and retails for just over $2000.

IMS EXPANDS

IMS Computer Systems Pty Ltd has established a new branch office in Gordon, NSW, which will be responsible for marketing and support in the State. Several staff have been appointed to the Gordon office and to IMS headquarters in Melbourne.

Coinciding with the opening of the new branch was the official release of an MS-DOS version of the IMS Ascent Series, an accounting package previously only available for CP/M-based systems. (IMS now claims to have access to "more than 90 per cent of the microcomputer market". The Ascent MS Series is written in compiled Basic (CB86) and incorporates "special disk storage techniques and access routines developed by IMS", according to the IMS technical director Cesare Tizi.

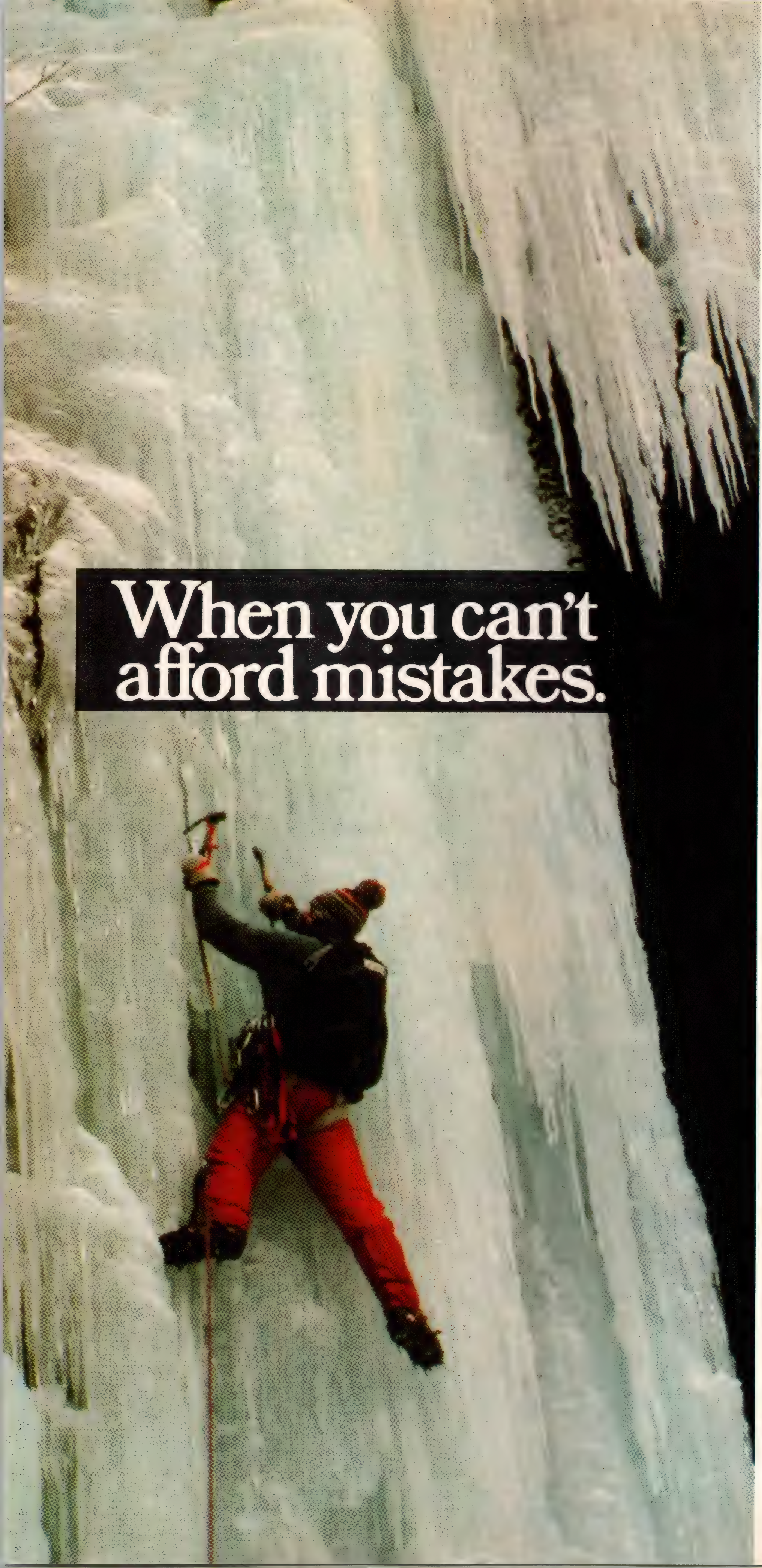
In addition to the Ascent MS Series, IMS announced the release of multi-user Ascent (to run on CP/M, Concurrent CP/M, MP/M, and TurboDOS), and a Professional Time Costing package.

NEWTECH TAKES ON RAMPAC

NEWTECH Development Corporation, through its US subsidiary Ramtron, has acquired the rights to yet another computer memory development, Rampac. NewTech claims Rampac will revolutionise memory technology and "take Australia to the very frontiers of electronic componentry".

The specifications for the prototype 1K-bit device include non-volatility, 20n/sec access time, infinite data storage life and a predicted lifetime of 10 billion read/write cycles. Whereas conventional memory devices attempt to compact as many discrete elements as possible into a single plane, the Rampac concept utilises a "cubic integration" technique, stacking the memory components in a separate plane above the remainder of the devices in the chip.

A group of scientists involved with the Rampac project recently visited Australia for talks with academics and government officials, as NewTech intends to establish manufacturing plants in Australia and the US.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EXECUTIVE SHUFFLE

AFTER several months of indecision, Computerland Australia has appointed a new managing director, Garry Vaughn, who was chief executive of the National Associated Retail Traders of Australia.

He succeeds American Andy Garrison who held the job for only a few weeks. Garrison retains his job as vice-president of Computerland's international division. Local Computerland management is reported to have lobbied for the appointment of an Australian managing director and has achieved its aim with the latest announcement.

Computerland Australia has also decided to distribute the popular IBM PC compatible Compaq portable. The US parent company, Computerland, has a world-wide distribution agreement with Compaq, and all machines will be sourced under this agreement.

The Compaq portable, weighing 12.7kg (with single disk drive), comes complete with an 83-key keyboard and built-in 9in monochrome screen display. The computer has been converted to a 220-volt power supply for sale in Australia.

The Compaq portable is a 16-bit machine built around the Intel 8088 microprocessor. The processor unit has a standard 128K-bytes of RAM (expandable to 640K-bytes).

Compaq is reported to be considering the establishment of an office in Australia following the establishment of an office in Europe earlier this year.

ASIAN PC

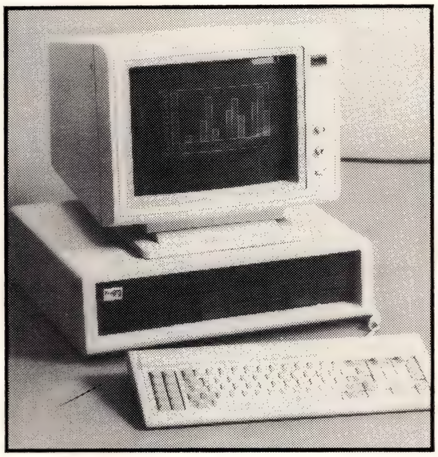
A NEW Melbourne company, Pantek Australia, has become the distributor for a PC compatible manufactured in Taiwan.

The Pantek PC features a system BIOS developed by the ERSO Committee, established by the Taiwanese government and staffed from three of the largest industrial organisations in the country. The committee was formed in response to pressure from American manufacturers who wanted to stop Taiwanese manufacturers of compatible computers from using exact copies of the originals' system software. Several of these manufacturers are reported to have helped the committee develop compatible system software that did not infringe any rights contained in the original software.

Systems using ERSO-developed software will be able to be imported, without challenge, into the lucrative US market.

Pantek has released two PC models. The base model has 128K-bytes of main board memory and dual 320K-byte slimline disk drives, while the PC XT equivalent hard disk model comes with 256K-bytes of RAM memory, a single 360K-byte disk drive and a 10M-byte MiniScribe hard disk incorporated within the system unit. Both models will be marketed under the Pantek brand name and will be identified as the PC-16 and the PC-16-E.

The base model Pantek PC-16 has a recommended retail price of $3195 (excluding sales tax) while the hard disk PC-16-E model will retail for $5275.



Pantek's PC-16.

Recent releases of other PC compatibles manufactured in Asia include the FOX 2001, PC301 and Emtech PC.

DOS HANDLES 4 JOBS AT ONCE

DIGITAL Research has released Concurrent PC DOS for the IBM PC, with other implementations to follow. Concurrent PC-DOS can run up to four PC-DOS or CP/M application programs at a time.

It also has an improved user interface, shortening the time needed to learn to use the IBM PC, and offers such capabilities as data communications, windows and improved productivity tools.

The multitasking feature of Concurrent PC-DOS lets an IBM PC user edit a report while receiving data from a database over a phone line, for example. Concurrent PC-DOS runs most of the popular PC-DOS applications, including Lotus 1-2-3, dBase II, Wordstar, MultiMate and SuperCalc 3.

Its window capability lets users see, and thus monitor, the execution of four applications simultaneously. Windows can be positioned anywhere on the screen, scrolled and sized to display the most important parts of each application. Information can be cut and pasted (moved) from applications simply by placing the window over the appropriate data.

Several productivity tools supplied with Concurrent PC-DOS include a print spooler, list management and a two-user feature, allowing two people to use the system at the same time. This is intended to allow remote access to the system.

Concurrent PC-DOS requires an IBM PC or PC-compatible system with 256K-bytes of memory and two floppy disk drives, although 512K-bytes and a hard disk are recommended.

Australian Digital Research distributor Arcom Pacific expects to release the product in July. The suggested US retail price is $US295.

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16-BIT COMMODORE

A NUMBER of significant announcements were made at this year's Hanover Fair in West Germany. About 650,000 people attended the eight-day event, which covers a number of different industries, including the computer industry. IBM alone had 500 people working its exhibit.

Among the interesting new products, Epson showed a lap-size computer with a pop-up eight-line by 80-character liquid crystal display. Like the company's more limited HX-20 system, the PX-8 lap machine will include a built-in microcassette for storage.

Commodore, which has long been a major player in the European computer market, showed a new and as yet unnamed machine based on the 16-bit Zilog Z8000 chip. Commodore is manufacturing the chip under a licensing agreement with Zilog. The system also has a proprietary graphics chip made by Commodore.

Slated for shipment in the US and Europe by the end of this year, the computer has 256K-bytes of RAM, two 1.3M-byte disk drives and a 15in color monitor display with an extremely crisp 640 x 400 dot resolution. It will also include a specially designed version of Coherent, a Unix Version VII-compatible operating system made by the Mark Williams Co, of Chicago.

Sig Hartmann, head of Commodore's software division, claimed Coherent on the new Commodore machine is better than other versions of the Bell Laboratories' Unix operating system on the market, because it has been specifically adapted to the Commodore micro and will have a number of new, easy-to-use features. A spokesperson for Mark Williams said the company already has several software packages planned for the new machine, including word processing, spreadsheet and database programs.

Commodore also showed its new IBM PC-compatible transportable, based on a design licensed from the Canadian company Bytec-Commterm which makes a similar unit called the Hyperion. It's expected to be strongly price-competitive with the IBM PC, but US shipment is not expected before next year.

LOTUS AI OPTS OUT

FOUR employees of Lotus Development Corp have left the company to continue and expand their work on artificial intelligence (AI) software. In an unusual arrangement, newly formed Prelude Development will license its AI technology back to Lotus.

Dollar amounts were not divulged, but the agreement includes provisions that allow the team to take with them materials they had been using at Lotus.

"We don't have to reinvent everything we were working on before or avoid sufficiently what we were working on before," a Prelude spokesman said. "Lotus will get some things that will be very useful for development technology."

Lotus will also pay Prelude for maintenance on the software being developed and delivered to Lotus. Other financial arrangements were stock oriented, the spokesman said.

The departure of the employees effectively wipes out Lotus' internal AI effort. Nevertheless, Lotus president Mitchell Kapor indicated that his company might start another AI development effort. "It's an area of active interest," he said.

Under the agreement, Prelude will deliver to Lotus within about two months "some fairly advanced development tools for AI programs," Prelude said. It was mainly Lotus' heavy concentration on its upcoming Symphony software and its de-emphasis on the AI effort that led to the split. Kapor ultimately agreed with the Prelude team that the AI effort would stand a better chance of succeeding if done independently.

Prelude expects to bring its first product family to market by next May. Aimed at IBM PC XTs and other machines, the software will be based on "what could be called intelligent databases, wherein the user doesn't have to worry nearly so much about the structure of information," a spokesman said.

"It will also have some very unique ways of presenting information," but the company would not elaborate.

Prelude says its software will not be as heavily spreadsheet-oriented as Lotus', but could be used to augment spreadsheets.

NO MORE APPLE

Apple *///* plus — on hold.

SOFTWARE suppliers for the Apple *///* were disappointed by Apple's recent announcement that it would stop further enhancement of the Apple *///* plus, the $US2300 desktop computer that has had many fans at Apple, but few buyers.

Apple is converting its Dallas Apple assembly line to produce Apple *//c* but, according to product spokesperson Barbara Krause, "we will continue to manufacture the *///* plus as long as there is demand. The only thing we're not doing is continuing further development of the machine."

OSBORNE FALLS IN

OSBORNE Computer Corp, operating under a court-approved reorganisation plan, introduced its IBM PC-compatible portable computer at the recent West Coast Computer Faire in San Francisco. Company representatives won't say when the Osborne PC will hit the stores, and are no more specific about its price tag than "less than $US3000".

The blue portable weighs about 13kg and comes standard with 256K-bytes of RAM, two double-sides disk drives, two serial ports and one parallel port, the standard Osborne keyboard and a 7in amber screen.

The model features a restart button to safely reboot any program, an RGB adapter, an expansion chassis that allows you to expand the computer's memory to 512K-bytes and a socket for an additional 8087 maths coprocessor. The company also expects to bundle the introductory models with as-yet-undetermined word processing and spreadsheet programs.

Osborne Computer says the portable runs with all PC-DOS and MS-DOS compatible software it has tried. Its Faire demo displayed Flight Simulator, a program often used to test a system's degree of IBM PC compatibility.

Osborne Computer also says the portable's keyboard is an "improved" version of IBM's — it has modified the left Shift key and the Enter key.

PEDDLE POWER

VICTOR Technologies is getting a helping hand from a former president who hopes to take charge of Victor's announced, but yet-to-be-manufactured, PlusPC computer.

Chuck Peddle, who stepped down as Victor's top officer last November, is still a major shareholder and supports the company he founded three years ago. Pending bankruptcy court blessing, Peddle, a pioneer in the microcomputer field, says he plans to license with Victor to manufacture and distribute the PlusPC.

Peddle and his partner, Bob Taylor, want their unnamed company to design and arrange manufacturing for the PlusPC, an IBM PC-compatible system that will also be available as an add-on to the Victor 9000 computer. It will be distributed through Victor's marketing channels, which include Applied Computer Techniques of the UK, a company that is in the process of buying most of Victor's operations.

Chuck Peddle — helping hand

TANDY PROTECTION

TANDY Corp has revealed that it will recommend the ProLok copy protection scheme for software publishers intending to market their products through Tandy's Radio Shack Computer Centres in the US. The company also will recommend ProLok to educational software developers whose products are sold directly to schools for use on Tandy machines. Tandy will implement ProLok on at least "some" of the educational software it publishes itself, a spokesman said.

Apart from publicly recommending the product, Tandy is also providing programmers and equipment to help ProLok's developers ready a TRS-DOS version of the protection scheme. (TRS-DOS is a proprietary Tandy operating system.) A new version for Tandy's MS-DOS machine should also be available soon, sources said.

IBM'S SCHOOL THRUST

IN AN attempt to slice into Apple's domination of the educational market, IBM has entered a joint-marketing agreement with Prentice-Hall Publishing to offer low-cost software tutorials for the classroom.

Teachers with IBM PCs, PCjrs or IBM Portables in the classroom will be able to choose from 20 software titles from 14 major companies, including Alpha Software, Ashton-Tate, Business Solutions, Business & Professional Software, Sorcim and VisiCorp. The IBM PC Apprentice series of tutorials consists of a $US14.95 workbook for each student and a workbook with lesson plans and a software workbook for teachers. The teachers' package costs $US19.95.

Included in the teachers' version is a licensing agreement that allows teachers to make copies of the diskette for each student with a workbook.

The initial programs, designed to offer a three-week course with one 45-minute session a day, will be appropriate for fifth grade through to college. A self-teaching version ($US24.95) that includes a disk and a student workbook will also be available.

In choosing the software for the initial series, primary consideration was given to the most frequent uses of personal computers: word processing, spreadsheets, database management and accounting, according to Prentice-Hall.

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- PC-DOS 2.0
- 128K RAM
- One or more disk drives
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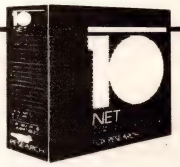

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APPLE AVALANCHE

ONLY hours after Apple Computer thrust its *II*c on to centre stage, dealers had ordered 50,000, according to Dave Larson, the Apple *II* Division director of marketing. He said those orders would be filled and on store shelves by the end of May.

Apple president John Sculley says a factory in Texas is already making *II*cs at the rate of one every seven seconds and 31,000 were ready for shipment before Apple introduced the newest member of its family at a gala event in San Francisco.

In front of 7000 reporters, analysts, dealers, Apple sales representatives and employees — some watching live via satellite — Apple president Sculley took aim at IBM and Commodore, Apple's chief competitors in the home. Alluding to IBM's slow-selling PCjr, Sculley said: "Compromise and ambivalence can be fatal flaws."

Of the Commodore 64, Sculley said: "Its price can get it into the home. The real question is, can it get out of the closet?"

ATARI LAY-OFFS

ATARI recently laid off about 100 workers in the second phase of retrenchments for the financially troubled home-computer company. According to a company spokesperson, the layoffs are part of a pruning and reorganising process that will cut jobs in areas such as administration, security, personnel and clerical help and will add jobs in product development, engineering and sales.

Another division hit hard was the Atari Program Exchange (APX). Atari has laid off all employees who manufactured the APX software and has shipped it through Atari's mail-order catalogue service. APX publishes Atari software written by freelance programmers and computer users.

WICAT TEACHERS

WICAT Systems Inc has been awarded a contract valued at $6.5 million by the Board of Trustees of the Garland, Texas, Independent School District, for the purchase of 100 of its Hydra system 300 computers.

"This is the largest single contract ever placed by a school district for computer-assisted instruction", says Dr Dustin Heuston, chairman of Wicat Systems.

Each of Wicat's system 300s support and run a broad range of Wicat educational software, encompassing all basic education subjects from mathematics through reading and language arts.

The Wicat Hydra uses a main computer to feed information to up to 30 student learning stations.

In addition to its teaching functions, the Hydra can be used to maintain student records, prepare reports and provide a variety of general office capabilities.

ROBOT WARS

ANTI-nuclear computer scientists in West Germany are rallying to unite the European scientific community. The group, sponsored by the Peace Movement organisers from the German Society for Mathematics and Data Processing, recently convened in Bonn. The meeting, entitled Computer Scientists Warn of the Programmed Atomic War, drew 3000 enquires from the European scientific community, sources report. The movement has targeted for scrutiny very high-speed integrated circuits technology and the use of robot warfare. The group has been joined in its efforts by the Computer Professionals for Social Responsibility, in Palo Alto, California.

KAY GOES TO APPLE

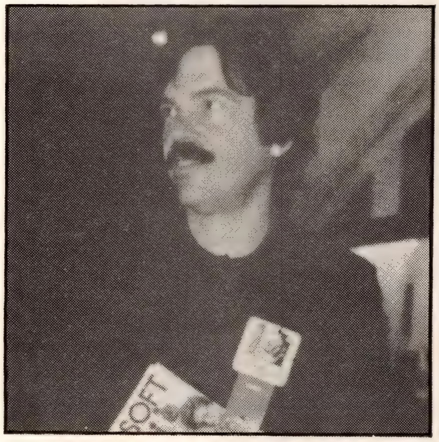
RESEARCHER Alan Kay has joined Apple Computer as an Apple Fellow.

Kay recently stepped down as chief scientist at floundering Atari.

He will work on user interface subjects such as artificial intelligence at his Los Angeles home.

Kay is well known in the industry for his work on user interface while at the Xerox Palo Alto Research Centre in the 1970s. He pioneered the concepts of windowing, pull-down menus and portable computing. Apple has already used many of Kay's concepts in its Macintosh and Lisa 32-bit computers and in the new *II*c.

Kay's work for Apple is expected to involve larger projects than his earlier ones.



Alan Kay — Atari to Apple.

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Televideo 912, 9020 with Datatype retrofit (Autograph 120)
Televideo 910, 950 with Datatype retrofit (Autograph 150)
ID-100 VB
VT100 with Digital Engineering Retrofit (DE VT640)
TAB 132/1S-G with TB600 Board
Televideo Terminal with Selanar SG900 board

Plotters

Calcomp 84, Calcomp 81, Goerz 284, Goerz 281, IBM XY/750
Hewlett-Packard 7220, 7225, 7221, 7470
Houston Instruments DMP-3, -4, -6, -7, -29
Panasonic VP-6801P
Strobe Model 100
Tektronics 4662
Watanabe 4675, 4636
Mannesman Tally PIXY3 plotter
AMDEK Amplot II plotter

Printers

Diablo 1640, 1650, 630 (as direct plotting device)
NEC Spinwriter 5510, 5520 (as direct device)
Anadex 9501 (as dump device)
Diablo 1640, 1650, 630
NEC Spinwriter 5510, 5520
Paper Tiger IDS-460
Epson MX80, MX100, FX100
Okidata 82A, 83A, 84 (also known as Microline, ICL . . .)
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Okidata 92, 93
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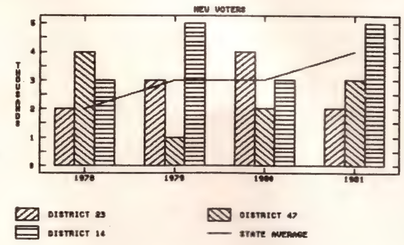

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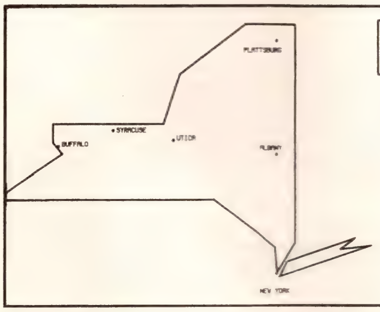

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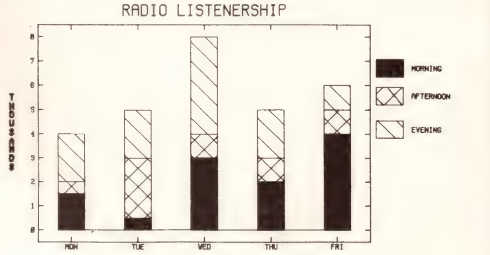

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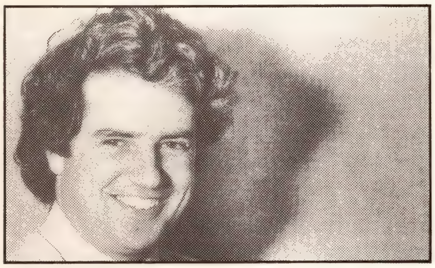
Ian Webster edits *Australian Micro Computerworld*

IF WE SAY IT'S NEUTRAL . . .



THERE is a peculiar statement buried in the Schools Commission response to the report of its National Advisory Committee on Computers in Schools. Sandwiched between statements that it is essential that the social consequences of the new technologies be carefully examined and that the way the technology is introduced can have a major impact on learning, is the assertion that these technologies can be seen as neutral.

This is an extraordinary statement considering the Schools Commission spends tens of millions of dollars in attempts to prise open the tight embrace of education technology based on classrooms, desks and blackboards. It is extraordinary, too, when the commission supports media studies in schools which take as their basic premise that technology is involved in the active construction of reality.

The assertion of neutrality is a panecea served up by the promoters of new technology anxious to avoid the difficult questions.

The acceptance of the idea that information technologies are neutral indicates the extent to which the commission was led by the technology entrepreneurs in State education departments. It also shows how unprepared interest groups are for the issue of new technology and education.

Possibly the most important insight Bill Marwood of the NSW Education Department Policy Support Unit had in his controversial computer education career was that *there is no community pressure for computer education in Australia.* This doesn't mean that all of those millions of dollars P&C organisations have raised for computers in schools aren't important. Most people conveniently forget that parents have directly funded most computer hardware in schools. What he is saying is that this interest and concern is not taken up by the parent, teacher and community organisations which usually apply effective political pressure to education systems.

The Schools Commission can usually call on a wide range of well-developed opinions and interests in determining policy in new areas. The interests of the education systems are balanced against other interests. On the Computer Advisory Committee, it appears as though only P&C representative Paul Jeremy, with his computer background, was able to contend with the education department entrepreneurs.

There are two consequences of allowing education bureaucrats to dominate computer education — a situation distinguishing Australia from most other countries developing computer education policy.

The first is that the use of computers to administer, organise and manage the system and its resources is carefully and deliberately separated from the issues of computers in the classroom and the curriculum. The use of computers is central to the location of power and control in the education system and will have a great impact on all aspects of education as teaching becomes less teacher orientated and more service orientated. Administrative use of computers, established in most States, will have increasing influence on the type and use of computers in schools. Several States, notably those with the biggest bureaucracies, have shown no intention of letting teachers have any say in how these systems are implemented.

The second consequence is the domination of computers and education by schools computing. All other areas of education that deal with approaches to the technology — from TAFE to community-based programs to home computing — work in the shadow of this obsession with schools computing. These areas could provide an opportunity to explore and develop approaches to teaching about technology free of the institutional restraints of the school system. In Australia, however, most activities are derivative of current schools practice.

While the education technology entrepreneurs have latched on to the key role education must play in developments based on new technology, they have tended to adopt a functional approach that can be described as an "innoculation" to prepare students to use the technology (be used by the technology).

Computer educators must be aware of the role they play in legitimising the technology and must learn to deal with computers as they are used in the construction of realities.

Computers are not neutral or transparent. They are part of a technology which teachers and students must disect and examine if it is to be understood, in the same way that primary and secondary students are taught about television and the print media.

People concerned about education and technology must not allow the bureaucratic concerns of State education systems to dominate learning with and about computers. The best thing the Schools Commission can do is to ensure that most members of its new Advisory Committee are not appointed to represent the interests of the education bureaucracies.

Doug Clapp is a regular contributor to the US computer weekly *Infoworld*.

DEATH OF THE USER

THE West Coast Computer Faire was like going to bed with your mother. The air was acrid with incest. Everybody was us. Industry people. Blue suits. Neckties. Socks. Well, not completely.

There was one "computer user" who tried to sneak in the back and wander around. Foolish naivete — not surprising in a user. Fortunately he was quickly spotted (you could not miss him) and brutally clubbed to death beside Digital's display (it was only fitting). The kid did not have a chance. Four venture capitalists, a literary agent, six marketing guys and the head of some big chain caught the kid. They threw control keys in his eyes, tripped him on an obscure licence agreement, then went at him with massive documentation in rigid, slipcover binders. You know the kind; sledgehammers could not have done it better.

It was the end of an era, and it passed without notice; the user's piteous wails were lost in the roar of agents making lunch dates with developers and authors. So it goes.

Okay, I admit that users were a romantic notion, like paddlewheel boats, clean air, Democrats and companies with 10 people on the payroll. It's nostalgic to imagine people using computers in the "real world". It's amusing to pretend that everyone doesn't know Pascal like the back of their teeth. It's quaint to think someone still can't strip off the high bits or does not know enough to throw in a couple of blank fields (just to be safe).

But who needs them? Like the dodo bird, users were a funny but ultimately stupid idea. Cute, but not built to survive. A transitory phenomenon. Not in, you know, The Plan.

But let us not over-romanticise their passing. They were, after all, more trouble than they were worth. First, they never had any money. Can you imagine travelling to San Francisco and not writing it off? Even if they did somehow arrive at the Bay, they could not afford the Mark Hopkins or the Hilton. And they would not know anybody. Why mention the fun you have had with (Big Industry Name) if your friends do not even know the guy? Jeez! How tacky.

The world turns, thank God. We could not have Jordache jeans and rhinestone roach holders until we got rid of hippies. We could not have the federal government until we got rid of Jacksonian democracy. We could not have American Express cards until we got rid of the "my-word-is-my-bond" crap. We could not have all the great micro-to-mainframe stuff until we got rid of the low-lifes without mainframes. We could not have 70-megabyte hard disks until everyone was "in the industry". Do you know what those things cost?

> ***I watched them drag the bloody corpse away through the crowd, trying not to stain the pinstripes in passing.***

There were a few (just a few) misguided, doomed-to-failure vendors at the faire who are still living in the past. The Borland International folks, for example, believe they can sell an incredibly superb, world-class Turbo Pascal for some 40 odd bucks. I mean, how can developers justify $700 for their products if they use a $40 compiler? After all, people do not buy these things, companies do. What is an R&D budget for if not for buying overpriced programming tools?

Let us remember the users for what they really were: a bunch of crassly over-eager youngsters full of stupid questions, dumb ideas and ridiculous notions. Notions like "Would not it be great for recipes," and "I wonder if I can make it play tic-tac-toe," and "Let's make it work with a color TV," and "Do you think they will ever get really cheap?" and "This could wipe out the power structure" and "Could I use the cassette recorder I already have?" How embarrassing.

Oh, I'm sure stories about users will persist for some time. Rumors that someone in Kansas is not working for some software-hardware - publishing - telecommunications company. This is Chariots of the Gods stuff. Factoids. Graduated build-downs. Talking dolphins.

Actually, the question of whether users actually exist is a moot point. The wealthy Victorians could hop a carriage to London and never see a person in rags. If pressed, they'd no doubt mull the question over, furl their brows, then reply: "Well . . . I suppose they exist, but . . ." The only proper reply to an outrageously tasteless question.

I watched them drag the bloody corpse away; wrestling the body through the crowds, trying not to stain the pinstripes in passing. I was a witness to history. He was wearing a T-shirt and jeans, of all things! I glanced down at the distorted, beaten features. For a moment, I thought I recognised someone I knew a long, long time ago. Then the body was swallowed by the crowd and the moment passed.

Just as well.

COMMENT

Norman Kemp is managing editor of *System User and Management* newsletter

AND ANOTHER MICRO STORY

CONTINUE LOOKING AT SCREEN AS THOUGH NOTHING IS WRONG.
REMOVE YOUR WALLET AND STICK IT IN SLOT INDICATED.
DO NOT SCREAM.

JUST how long should it take to get a business computer system up and running in an ordinary office environment? It is a question often asked by computer buyers. Unfortunately the question is not asked often enough before orders are placed, but only with some exasperation about three months after the unit has been paid for and is still not doing the job as promised.

Over the past six months, I have watched two installations of the same microcomputer systems for one company, each with similar requirements, but the offices are separated by the width of Sydney Harbor and then some. The company sought the advice of a consultant, who was able to recommend a reliable make of computer and adequate software for both offices, although the software would need some modifying.

For Office A, the database requirement for compiling mailing lists and printing address labels was about twice as long as that for Office B and needed some more customising for four individual users. But in other respects there was little to differentiate between the systems.

The managing director of the company was inexperienced in computers and baldly announced he was not interested in supervising the systems — for which he would be paying substantially. Office B, the good guys, held a meeting to discuss ways and means of getting used to the system quickly, training the necessary staff, and hiring the consultant's programmer for extra tuition and program modification.

After about three weeks training and another month for system familiarisation, Stage 2 of development was ready to begin. The system is used every day and Office B has been getting a return on its investment.

In contrast, Office A was a scenario for disaster, and nearly five months after the computer was delivered it is only just beginning to meet the initially envisaged requirements. No mechanical or electronic breakdowns occurred, but there was a completely different staff attitude which has cost the company considerable time and money, and has delayed completion of Stage 1 from just after New Year until early May.

Since the managing director chose not to make the decision, responsibility for getting the system up and running was not delegated to any of the staff, until eventually one clerical assistant volunteered to learn the installed database.

> ***Responsibility for getting the system running was not delegated to any of the staff until a clerical assistant volunteered.***

But when things are bad they can only get worse, and the customised program turned out to have some bugs that necessitated parts of it being rewritten. While this was being done, the operator gave three months' notice for maternity leave.

Moreover, building extensions which began in the office around Christmas dragged on, and almost three months elapsed before Telecom Australia changed the phones, electricians finished their rewiring, and a new carpet was laid. During this confusion, work resumed on the previous manual methods, and the computer sat on a desk like a forgotten parcel on a lost property shelf until someone remembered to dust it off and try the program again.

After more patching and more delay, the program was finally judged to be working right — on the eve of the farewell party for the operator who had put in the original hours of office-paid time to learn it! True, a replacement assistant had started several weeks before, but a new training procedure has had to be instigated and other developments proposed for the computer have been postponed.

The cost, which has included additional programming time not previously allowed for to enable the program to be altered, has soared, the machine is still not operating at full capacity.

Office A is a classic case of not only misfortune, but also poor management and lack of planning. But perhaps more inexplicable is how it could happen within an organisation which had installed a similar computer system at almost the same time without trouble.

The primary reason was at the top. No managing director should absolve himself of responsibility.

It was a matter of luck that Office B was better organised, knew its requirements and was able to draw up a coherent starting plan for the programmer. A senior staff member was delegated to take charge of the system and to maintain contact with the consultant throughout.

The lessons of Office A have yet to be learned by many companies ordering computers without first thinking their requirements through or making certain that a senior person will be responsible for supervising the installation at all stages. It is too often forgotten that a computer should not be bought until its needs and uses have been fully studied.

John Dvorak is a consulting editor for *Infoworld*

DID THEY USE AN AXE?

WHEN I was in Arlington Heights, Illinois, recently, I heard a story that at first I thought was pretty funny — then I realised that this funny story will result in not-so-funny tragedies and maybe some **genuine horrors.**

The story was about how some devilish young programming genius created a version of Apple DOS called Killer DOS. It is reminiscent of a kind of program called a worm. Worm code is specialised programming usually found on mainframe computers. It is designed to act independently of the operating system and somehow worm its way through the system and pop up here and there on various terminals with **snide messages.**

If well written, it is impossible to trace and sometimes impossible to get rid of. Just as a **herpes virus** attaches itself to a nerve cell and lies dormant for a while, so too will worm code hide in a backed-up file, ready to sneak back into the operating system at any time. Killer DOS works like a worm. The contaminated DOS is booted on an unsuspecting computer, then it copies itself into RAM and any other DOS found on any other disk.

In the case of Killer DOS, the program waits for a fixed number of disk accesses and then (after maybe a whole day's work passes) goes to work. First, it **locks up the keyboard;** second, it erases all disks in the system; and finally, puts a message on the screen: **"Killer DOS strikes again!"**

At first glance this may seem like an innocuous prank. But what happens if the disks contain important medical information on someone? **Or worse,** what if the machine is monitoring medical instruments keeping someone alive? While I may seem melodramatic about this, let's face it, this is simply a new **high-tech version of juvenile delinquency,** but it's going to get worse before it gets better. I've always suspected that the **high-tech punks** I know urge the implementation of the Unix operating system for the simple reason that it is easier to **sabotage** than a more simple, compact operating system.

The first worm program was done on the Department of Defence ARPAnet system in the late '60s. At the time, the program was called a **creeper.** Counter-measures were taken by systems programmers to rid the network of the creeper program. The antidote was called a **reaper.** The term worm was first introduced in a John Brunner book, Shockwave Rider. It is a story about a futuristic **fascist society** run by a computer network. The hero created a worm program to destroy the social structure and bring back democracy.

The most **notorious real-life worm** program was injected into the UCLA system. It was called Pinball. It hung around the operating system for months and then would pop up with a message on the system console that said: "Let's play pinball!" The screen would **go crazy** as the program took over the computer and moved the heads on the hard disks back and forth as fast as they'd go — all the while erasing files.

Heard The Funniest Story Yet Dept. Supposedly, Atari set up a scam operation to catch pirates and it turned out not to make very good publicity. The company is mum about it. It goes something like this: Atari was getting **sick of pirates,** especially since the whole line of as-yet-to-be-released George Lucas games showed up on a few pirate boards. So here's what it allegedly did. The company put together a focus group to evaluate game software. A focus group is an **avant-garde** market-research technique where you put a lot of people in a room and trick them into saying what they really think about something. The results are very biblical — open for interpretation.

Atari loves these focus groups for all the good they do it. We can assume that the **idiotic** "fire" button on the Atari 5200 game machine was somehow approved by a focus group. The IBM PCjr is also a focus-group-influenced machine — get the picture?

Okay, so Atari loves these focus groups and everyone knows it. Nobody would suspect that this focus group was a ruse; **a sting.** They show this group of kids a **hot game** called Legacy. Everyone talks about it. The session ends. The point man for the scam asks the kids if any of them would like a copy. Sure, we all would, say the kids. Fine, just sign this nondisclosure form and promise you won't copy the program, says the point man.

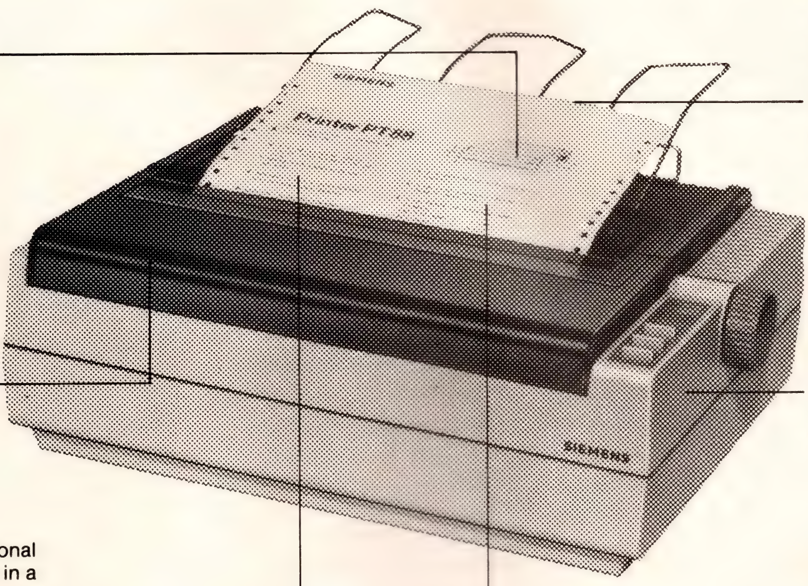
Unbeknown to the kids, each disk is **specially serialised.** One, two, three days go by and a bulletin board in the San Francisco Bay Area, The Rats Nest, has the game available. Atari security **swoops down** on the operation and shuts it down. Acting like Eliot Ness clones, they track down the poor kid who got the serialised version and bust him.

I don't know the status of the kid at this point or whether they **used an axe on his equipment.** I'm sure a reader will be glad to fill me in on the details.

So what's accomplished? The company scared some kids. **Big deal.** Atari would be better off spending its money on R&D to bolster its sagging product line.

SIEMENS

A closer look at a far better printer



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NEW ACCOUNT ON PADMEDE

Thank you for including Padmede Software in your review of accounting packages in the April 1984 issue of Australian Micro. While I consider Ron Pollak's comments fair in most areas, I feel I should make the following points.

The word VAT does not appear on any screen or report produced by the Padmede system. The only place it appears is in the manual — usually together with the words "Sales Tax".

For example, on page 4, line 14 of the Debtors manual, the following appears: "Value added or sales tax summaries are also automatically updated" or Item (C) on page 7, "VAT (sales tax) output is the total tax charged on goods sold". Your comments indicate that "VAT" is used instead of "Sales Tax". This is not true.

Our manual is printed for use in the UK and Australia, and thus contains dual terminology. However, we will be reprinting shortly and, so as not to confuse future reviewers of our software, we will print the Australian and UK manuals separately. Not one of our 1000-plus users of Padmede has ever complained about any of the terminology either shown on reports, screens or in the documentation.

Your comments concerning omission of a data entry mode in the Accounts Payable module are wrong. The Creditors allows you to step through all the fields in exactly the same way as Debtors (in fact, it uses the same program module). Your mistake was probably pressing Esc before you had completed the data entry.

Your comment on General Ledger that "it is not possible to scroll through the previous entries" is wrong too. If you refer to pages 14 and 15 of the General Ledger manual, items 1.15 and 1.16, or look at the prompts shown at the bottom of the General Ledger screen when you finish keying in a batch before updating, you will see that any entry in the batch can be located and changed by entering its reference number. The typing of "N" is used to scroll through the four screens of possible entries.

Reviews such as yours are very important to us and it is extremely annoying when criticism is based on a false premise. Obviously you have the right to make any comment you like but surely have a responsibility to ensure their accuracy.

John Perry
Director
Personal Computer Services Pty Ltd

Ron Pollak replies:

Thank you for your comments regarding our review of Padmede software.

VAT. We accept your comments made on this aspect. As we stressed in our article, however, we believe that documentation is very important and we are, therefore, extremely pleased to note that you are in the process of tailoring your manuals for local conditions.

Accounts Payable and General Ledger. You are quite correct in your comments with regard to creating masterfiles for Creditors and scrolling through General Ledger journal entries. There appears to have been some inconsistent test data which caused the reported problems.

In conclusion, we believe that, nothwithstanding these matters, the review reasonably reflects the strengths and weaknesses of the Padmede system. We wish you future success in selling your software, a package which we hold in high regard.

STANDARDS ON RADIATION

The article on the supposed radiation hazard of VDTs, published in the February 1984 issue of Australian Micro Computerworld, has recently come to my attention. While it would be possible to criticise the article for its lack of objectivity, it would be unproductive at this time. I would rather concentrate on positive aspects of the Standards Association of Australia's work which may be of interest and assistance.

The association is preparing two standards which apply to the situation described in the article — the first, to be published this month, is on the lighting and visual environment for screen-based tasks. This standard is intended to establish an environment for the operator which will provide protection against eye strain, headaches, back and neck aches which are often the subject of complaints from people operating equipment embodying screens.

The second standard, which will be published later this year, if the committee concerned can reach consensus, is on the known and potential hazards caused by radio frequency radiation in the frequency range above 0.3MHz. It does not, therefore, cover VLF or ELF radiation, but concerns itself only with radiation used for radio communication.

Recommendations, confined to such radiation in the range 0.3MHz to 300GHz, are made covering a variety of equipment working in this range and including screen-based equipment, despite the fact that current knowledge precludes them as causes of biological problems for humans — male or female. Measurements made in Australia show no evidence of radiation at levels higher than the background radiation to which we are all exposed daily.

R.K. Profitt
Executive Officer
Standards Association of Australia

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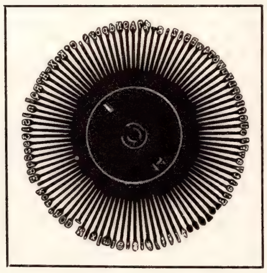
. . . Electronic text printer



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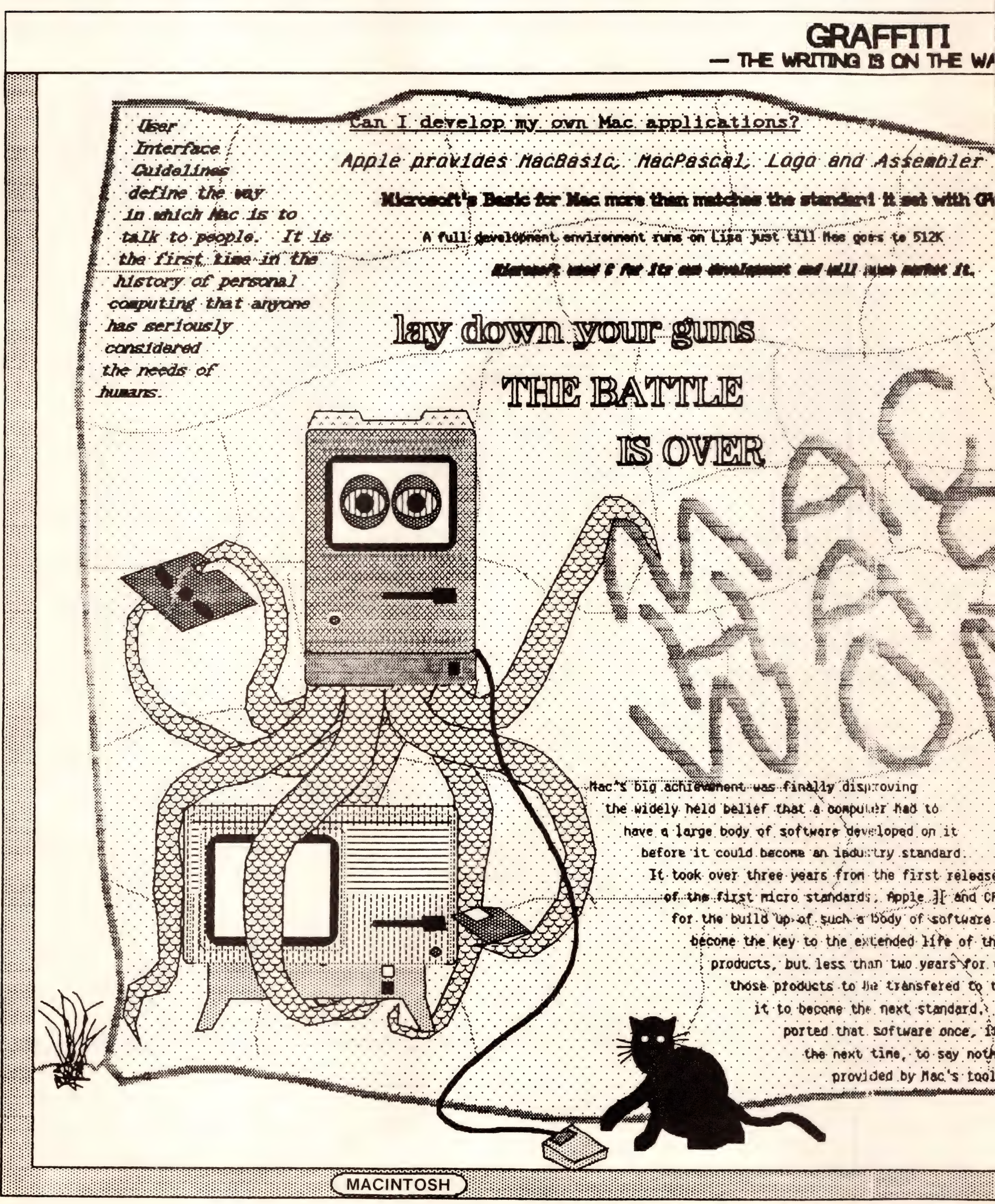

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has seriously
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the needs of
humans.

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Microsoft's Basic for Mac more than matches the standard it set with GW

A full development environment runs on Lisa just till Mac goes to 512K

Microsoft used C for its own development and will [illegible] market it.

lay down your guns

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IS OVER

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before it could become an industry standard.
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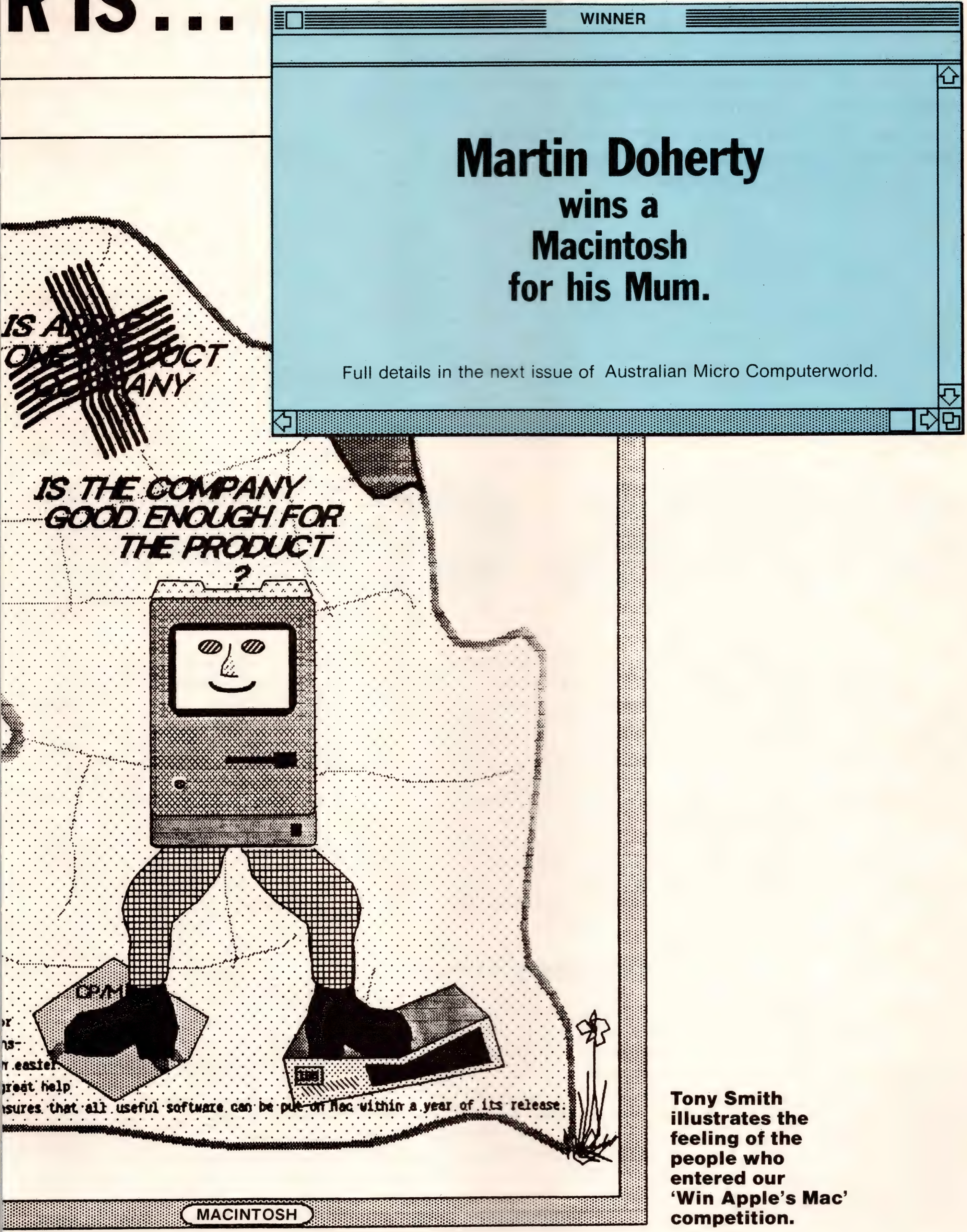
for the build up of such a body of software
become the key to the extended life of th
products, but less than two years for
those products to be transfered to t
it to become the next standard.
ported that software once, i
the next time, to say noth
provided by Mac's tool

R IS . . .



WINNER

Martin Doherty
wins a Macintosh for his Mum.

Full details in the next issue of Australian Micro Computerworld.

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MACINTOSH

Tony Smith illustrates the feeling of the people who entered our 'Win Apple's Mac' competition.

CMOS integrated circuits traditionally have been used in digital watches, where long life and low power consumption are imperatives. But new advances point to CMOS as the next step in the evolution of the integrated circuit. As computers get smaller, faster and more powerful, more and more of the chips that make them go will be CMOS.

Howard Dicken and Robert Luhn investigate the technology

COOL CHIPS

KEEPING cool is desirable in almost any situation; it's a must when you're one chip among many crammed into the back of a computer.

Most silicon components — RAM and ROM chips, telecommunications chips and other integrated circuits — use only a fraction of the energy they receive, releasing the rest as heat. With a power supply, a disk controller board, and a monochrome adapter board all occupying the same bulky box, system temperatures can climb to 80° Celsius. The result is a computer that feels like a personal space heater. In extreme cases, components overheat and the system crashes, requiring system reboot and destroying all or part of the file you were working on.

Engineers have solved the heat problem in larger computers by wrapping them in water jackets or submerging them in supercooled liquids — an unlikely solution for personal computer users. The trend toward smaller, more powerful computers requires the use of multi-function chips that perform multiple processing, handle complex communications tasks, or simply pack more RAM into the same volume.

As more circuits are squeezed on to a chip, the inefficiency of current designs (expressed as heat) becomes acute. And when chips are more closely packed, as they are in a portable computer, reducing heat is essential. Solutions to date have ranged from the mundane (fans) to the esoteric (bubble memory).

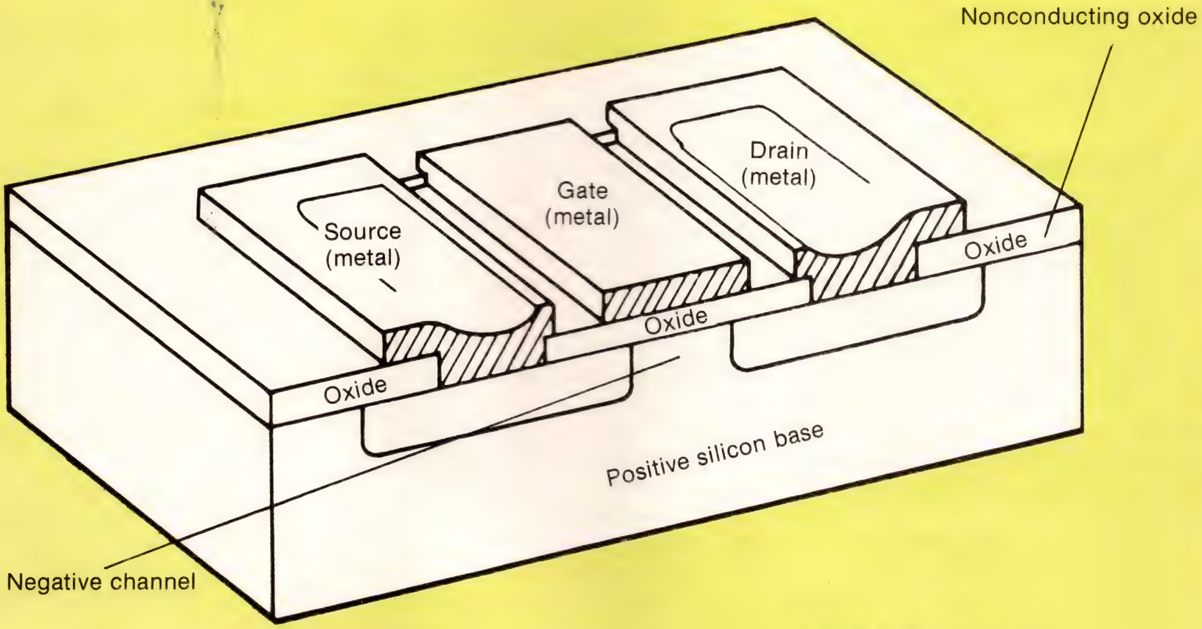
THE CMOS SOLUTION

CMOS (complementary metal oxide semiconductor) fabrication methods may be the answer to this problem. The CMOS process is not much different from or more expensive than the processes used in fabricating chips common to most computers. The resulting CMOS device works as fast as other chips and requires only a 10th of the power.

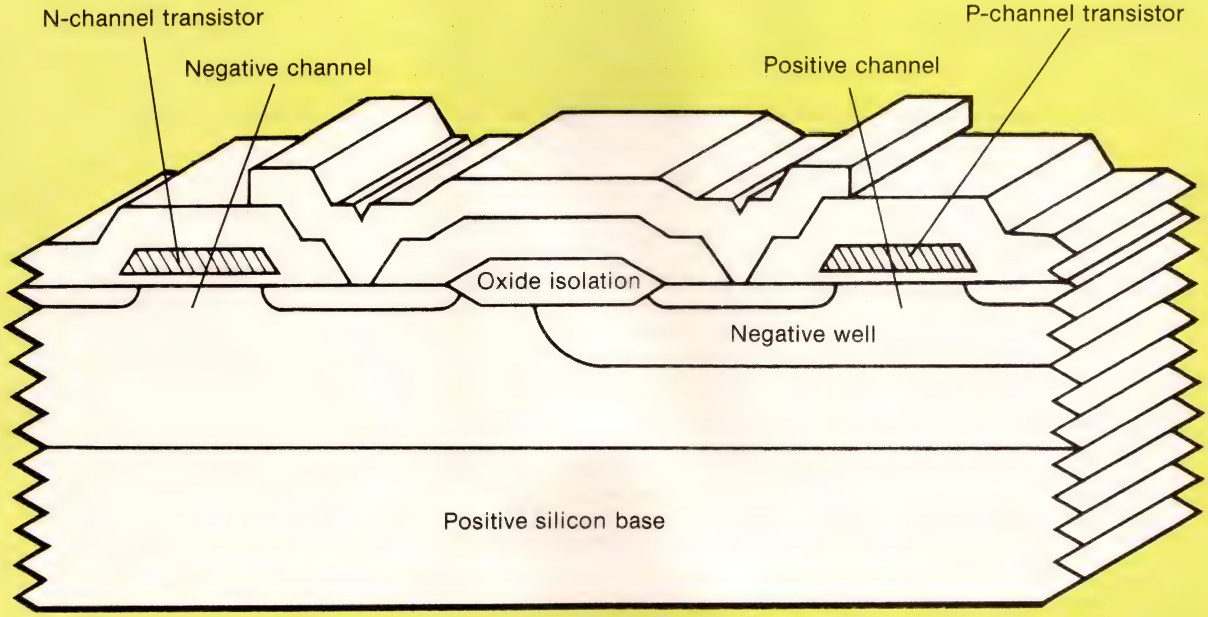
Less power means less heat; the connections that make up a CMOS circuit can lie closer to one another, increasing the circuit's operating speed. Similarly, circuits can be packed more closely, making for a smaller chip or one that has more circuits and thus more capabilities. The flexibility of CMOS makes possible everything from a smaller 8088 to a single-chip multiprocessor.

CMOS was once relegated to the industry's back burner because its early designs were slow and difficult to produce. But recent advances in high-resolution optics, which play a major part in the design of miniaturised circuits, make CMOS competitive in price and function.

CMOS devices are showing up not only in high-priced briefcase computers but in portable and some desktop models, including many IBM PC-compatible machines. With power requirements significantly lower, a computer with CMOS components can use a smaller and less expensive power supply; since very little heat is produced, fans can be scaled down or eliminated



NMOS Device



CMOS Device

entirely, giving designers the option of adding more hardware or further reducing the size of the computer.

MAKING CMOS

Many standard integrated circuits are NMOS (negative-channel MOS) that use negative transistors to control the flow of electrons through a circuit. Less common, but based on the same principles and technology, are PMOS (positive-channel MOS) circuits that use positive transistors. A CMOS chip combines features of both, which is one reason for its versatility and frugal power use.

Silicon is the key ingredient in the construction of any integrated circuit. Because its crystalline structure does not easily conduct electricity (hence the label semi-conductor) and resists the introduction of foreign elements, silicon acts as a stable base. Under the proper conditions a silicon wafer can be embedded with elements that will conduct a charge. When these elements are laid down in predetermined positive or negative channels, electrons representing data can be shuttled and stored throughout the various layers of a chip to perform any number of tasks.

Like its NMOS peers, a CMOS chip comes from an ingot of pure silicon that is sliced into thin wafers. Each wafer becomes the repository of many hundreds or thousands of circuits, transistors, diodes and other miniaturised components that make up a functioning chip. Once a wafer has been cut successfully and tailored to the proper size, it must be "masked" and "doped"; in other words, the conductive channels that make up the circuits must be laid out and embedded into each layer on the wafer.

First, a circuit diagram is drawn and photographed, then the picture of the diagram is reduced and projected onto a wafer coated with a light-sensitive "photoresist" layer. Those areas of the layer exposed to the light "wash" away when the wafer is put in an acid solution, revealing the circuit diagram. The circuit pathways are then embedded with either negatively ionised phosphorus atoms or positive boron atoms. Ionised atoms are embedded by an ion implanter that operates much like an electron gun in a television set, firing an extremely narrow beam of particles into the wafer.

Another common method of embedding ions is to heat the wafer to 1000 degrees Celsius and expose it to gaseous phosphorus or boron. With either method, the atoms are forced into the crystal structure of the silicon, creating areas in the wafer that have a surplus of positive and negative charge.

Up to 10 separate masking steps

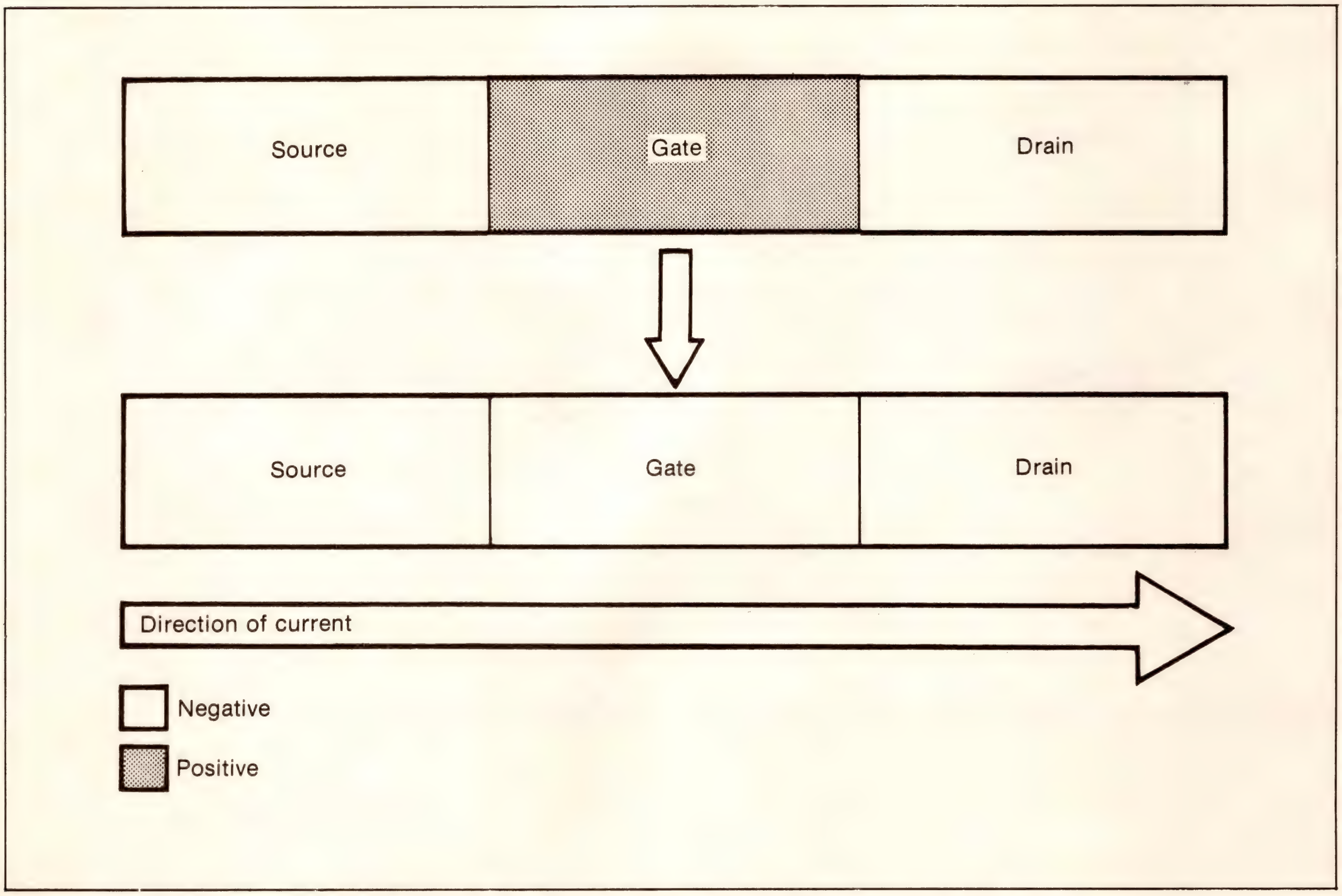


Figure 1: A connection between the source and drain is made by changing the charge of the gate.

are required to make a functional CMOS chip. After a wafer has been completely processed, the individual circuits are tested, and the ones that pass muster are put into a multiple-pin package.

CMOS STRUCTURE

Circuits in a wafer work in three dimensions, connecting with one another vertically as well as horizontally.

Once the necessary circuits are in place, how are they isolated from one another? How do they communicate?

Built into the circuits are diodes, which allow current to flow in one direction only. When a diode connected to a circuit faces another diode, an electrical impasse exists — current cannot pass between them. The circuits in effect are isolated and cannot share data. But part of CMOS's flexibility comes from its switching nature, which permits data to pass in a controlled fashion between circuits that are logically related.

The switch is actually an area of silicon called the gate, which sits between the ends of two diodes facing each other. If, for example, the ends are both negative, the gate is positive. Current will not pass from one end (the source) into the other (the drain) unless something changes the gate's charge from positive to negative. That is done by sending the appropriate signal through the silicon gate. A new circuit is completed, and the formerly isolated areas are connected (see Figure 1).

NMOS circuits also use gates, but the construction of each circuit centres upon a negative transistor (see Figure 2) paired with a load resistor that reduces the flow of electrons in a circuit. The change the resistor effects in the current level is used to represent data — it works like a crude on and off switch. But a resistor is not terribly efficient in controlling current; the heat it produces as it "slows" the electrons results in loss of data and power.

CMOS circuits replace the resistor with a positive transistor. The exact pairing of positive and negative transistors in CMOS effectively creates balanced circuits that require little power. Turning the circuit on or off and directing current to a particular area requires merely opening or shutting the appropriate gates.

As a result, a CMOS circuit uses a 10th of the energy required by an NMOS circuit to control the switching and direction of current. Because CMOS chips operate at such low power levels, a few volts can keep 256K-bytes of stored data secure for a week. This alone has made CMOS popular in digital watches and briefcase-sized computers that use batteries as the main power source.

FAST CHIPS

For reasons relating to the physics of semiconductors, circuit speed is greatly affected by the distance between two diodes — the longer the gate, the longer current takes to flow. The relationship is geometric; doubling the gate length effectively quadruples the time involved.

Although CMOS chips use less power than standard semiconductors manufactured by other methods, they operate as quickly. The key to CMOS's speed is reduced space between gates and other junctions. Improvements in photolithography allow engineers to design and project finer and more complex circuit diagrams onto silicon wafers.

CMOS's low heat dissipation, which keeps components in close quarters from fusing, makes it possible for gates to be shorter and connections to be closer. CMOS's increased miniaturisation truly proves the adage that "small is beautiful" and enables CMOS devices to match or surpass the performance of competing semiconductors.

IN THE CHIPS

The price of CMOS technology has fallen considerably in the past year, but the cost of producing a CMOS chip can still be as much as 20 per cent more than its NMOS equivalent. Nevertheless, more and more companies are producing CMOS circuits as replacements for or alternatives to their existing semiconductor devices.

CMOS versions of 8- and 16-bit microprocessors, RAM, ROM, and EPROM chips and the circuits that drive liquid crystal displays are being produced by companies such as Harris Corp, IT&T, Motorola, National Semiconductor and Texas Instruments.

Noteworthy is Intel's agreement with Inmos to develop high-speed CMOS RAM products. Under this arrangement, hardware manufacturers considering the CMOS alternative will have two supply sources for the same components. Intel's

	CMOS	ECL	TTL	NMOS
Gates per circuit	8000	2800	2400	4000
Gate switching time in nanoseconds	2.0	0.5	2.0	3.0
Power per gate in milliwatts	0.1	2.0	0.4	0.5
Spacing between gates in microns	3.0	4.0	5.0	3.0
Masking steps	10	11	10	9

Table 1: Semiconductor comparison

interest in this technology alone should assure the acceptance and use of CMOS.

COOL CHIPS, HOT SHIPS

CMOS circuits are found in everything from digital watches and space shuttle computers to lap-sized computers. The IBM PC does not use CMOS devices at the moment because the higher cost of CMOS offsets any advantages gained by lower power requirements. But when users demand a smaller computer with the same computing power and memory as a PC, the resulting thermal density problems will require a change to CMOS. A number of PC compatible portables are already using CMOS technology, and more are likely to do so as production costs for CMOS continue to drop.

This is not to say that IBM is resisting CMOS technology. The PCjr uses CMOS in its wireless, battery-powered keyboard. Since the keyboard's infrared link to the CPU soaks up most of the unit's power, energy-efficient CMOS components are a must.

Harris Corp, which makes CMOS-based microprocessors for Digital Equipment Corp, has released CMOS versions of the PC's 8088 microprocessor and its true 16-bit peer, the 8086. The latter processor is being used already in several PC compatible computers.

Also near the forefront of CMOS technology is Tecmar's ForgetMe-Not plug-in board for the PC, which features 32K-bytes of CMOS RAM and a rechargable battery pack. Preselected portions of a program or a text file can be saved for up to a year without an external power supply. The company notes that four of these boards can replace one single-sided disk drive.

Intel offers a I64K-byte dynamic RAM CMOS chip that operates four times faster than its NMOS equivalent. The part requires only two per cent of the NMOS's standby power and is a likely choice for users wanting high-performance memory in portable computers or faster RAM disk drives. Other CMOS applications include a 64K-byte EPROM from Hitachi (for computer and instrument use), a radiation-hardened 4K-byte RAM from RCA (for satellites and military computers), and National Semiconductor's 300 bits/sec modem-on-a-chip that is built into a computer or terminal.

CMOS devices accounted for nearly a third of semiconductor sales last year, and industry analysts expect CMOS to dominate the semiconductor market by 1987. Though its uses are only starting to be explored, CMOS is likely to keep computers cool for a long time — or at least until engineers replace the integrated circuit.

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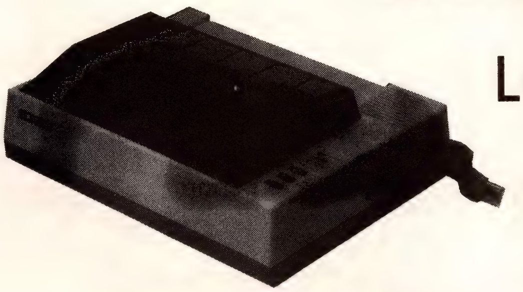

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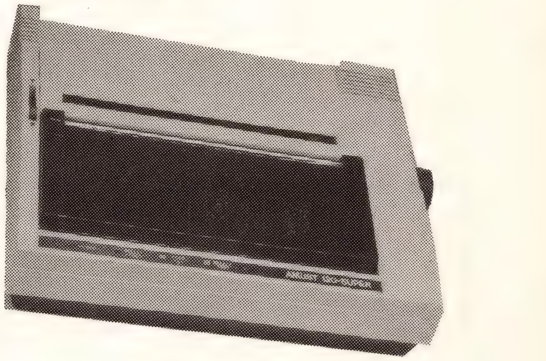

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While new product announcements continue to flood the computer press, the gap between the announcement and the appearance of the products on the shelves of Australian computer dealers seems to get longer and longer.
These product previews will provide readers with a profile of state-of-the-art products before their release in Australia

PREVIEWING the Products

HEWLETT-PACKARD'S LAPSIZE HP-110

THE newly introduced Hewlett-Packard HP-110 is a lap-size computer weighing 4kg. The HP-110, with 272K-bytes of RAM, a retail price of $US2995, and a host of built-in applications, is pitted against transportables such as the Compaq and TeleVideo machines, a Hewlett-Packard spokesperson said.

The HP-110 differs from many transportables and notebook computers in that it is based on the 8086 microprocessor. HP says the machine is twice as fast as the 8088-based IBM PC or PC XT. The HP-110 uses CMOS technology, which requires little power for operation.

The MS-DOS computer offers a 16-line by 80-col LCD that flips up and adjusts to any angle. The Sharp PC 3000 and Gavilan also have flip-up LCDs. A 24-line display is unavailable for the HP-110, and there are no plans to provide one.

The machine does not have an on/off switch, but is activated when any key is pressed. It is switched off by hitting one of the eight programmable function keys or shuts off automatically after a user-specified time (30 seconds to 30 minutes).

Unlike most of the lap-size units on the market, the HP-110 includes several built-in applications on one chip — Lotus 1-2-3, the MemoMaker word processing package, terminal emulation for communications, and the personal applications manager (PAM) systems utility. Together with MS-DOS 2.11, the built-in software is worth more than $US1000 retail, and takes up almost 400K-byte of RAM, product manager, Tom Darnell, says.

HP is banking on the HP-110's communications capabilities to appeal to the business market. The system comes with a built-in 300-baud modem, which allows users to transmit data to mainframes and minicomputers. Users can transfer data to the HP-150, IBM PC, and other MS-DOS machines with the HP interface loop and portable-desktop link, an optional $US150 plug-in card with software. With the built-in terminal emulation package, users can transform the computer into an intelligent terminal and access data from larger systems.

Some of the machine's key drawbacks are the hidden costs for users who buy extra software. For instance, if a user wants WordStar on the HP-110, he or she must buy the package, as well as a $US795 battery-powered disk drive. Another option is to transfer the application to the HP-100 from MS-DOS desktops via the optional portable desktop link.

HP says more than 100 software programs such as dBase II, Microsoft Basic and Sales Edge by Human Edge Software will be offered by the end of the year. When Lotus Symphony, a five-function integrated package, is released later this year, users will be able to enhance the HP-110 to include Symphony in ROM.

Because the HP-110 is aimed at mobile professionals, developers have checked with the US Federal Aviation Administration to ensure the computer's electronic emissions will not interfere with aircraft navigation equipment. The system is powered by three permanent, rechargable, lead/acid D-cell batteries that give 16 hours of continuous use.

The uninitiated won't see any difference between this and the Apple *II*c, says a senior market analyst, Sandy Gant of InfoCorp, of California. "HP will have to communicate its features effectively to the public," Gant says. "Personally, I like the machine. It comes on, and it works easily. But it seems that it could have been priced cheaper."

HP-110 portable.

ASHTON-TATE'S FRAMEWORK

ASHTON-TATE has just released an integrated windowing software package for the IBM PC family that features word processing, file management, graphics and spreadsheet analysis. The package will also include a rudimentary programming language and an outlining function similar to that of Living Videotext's ThinkTank "idea processing" software.

The new software, called Framework, derives its name from its windowing capability and pull-down menus, made popular by the Xerox Star workstation and Apple's Lisa and Macintosh computers. Framework is expected to be Ashton-Tate's major product for this year. It will compete with other integrated-software packages such as Lotus Development's recently announced Symphony package (an upgraded version of Lotus 1-2-3 and Context MBA.

The $US595 package requires 256K-bytes of RAM, two disk drives and the IBM PC or a compatible machine. It is expected to be available within the next few months.

Framework is one of the first packages to use an outlining function, which offers the user a ready-made structure into which ideas are put. The outline will accept text, such as chapters of a book, or will accept any combination of spreadsheet, graphics, text and lists. Each outline could be a presentation or a project-management tool that contains various cost-analysis charts, memos and "what-if" projections.

"Frames are central to the technology. A frame is a way of structuring information," said Robert M. Carr, chairman of Forefront, the California company that developed Framework with the intention of having Ashton-Tate market the product. A number of frames can be open at one time and — true to the outlining feature — can contain a frame within a frame within a frame. Frames can be of varying sizes, including full screen.

Only one frame at a time can process data, but changes made in one frame will result in automatic changes in a second frame if the user so desires. For example, a bar chart derived from a spreadsheet will change automatically when any cell is altered and the spreadsheet recalculated. Data in one frame can be moved or copied to another using the same commands used to move data within the same frame.

Framework has a number of features not found in many of the integrated window packages now crowding the market. Among these features is a window to the IBM PC's operating system, which allows users to reach DOS without leaving the Framework program.

By using the DOS window, users can also run a second program for communications or other applications. The program placed in the DOS window then becomes part of Framework. Although the level of integration for the DOS window is more limited, "you can expect Ashton-Tate to bring out a number of applications for the DOS slot," Carr said.

The package will display pie, bar and other graphs on a monochrome screen without the need for a graphics board. Any graphics produced with the package can be placed within a body of text when a document is printed out.

The functions of Framework are executed through a choice of pull-down menus, program function keys or control keys. The choice is designed to accommodate both the new and "power" user, Carr said. All cursor controls are executed via the keyboard and a total of 130 commands perform all the functions of the package. For instance, functions such as Copy and Move are the same in the spreadsheet as they are in word processing.

The functions of Framework use an English-language echo line on the bottom of the screen, which displays the current status of the defined area being used. On the spreadsheet, the highlighted cell's formula would be displayed in the echo line. "Users need to be able to find their way around the menus without getting lost," Carr said.

A programming language is also available to overlay formulas onto the spreadsheet. Formulas specific to vertical markets such as insurance or manufacturing can be produced and saved by the user or

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☐ TAB
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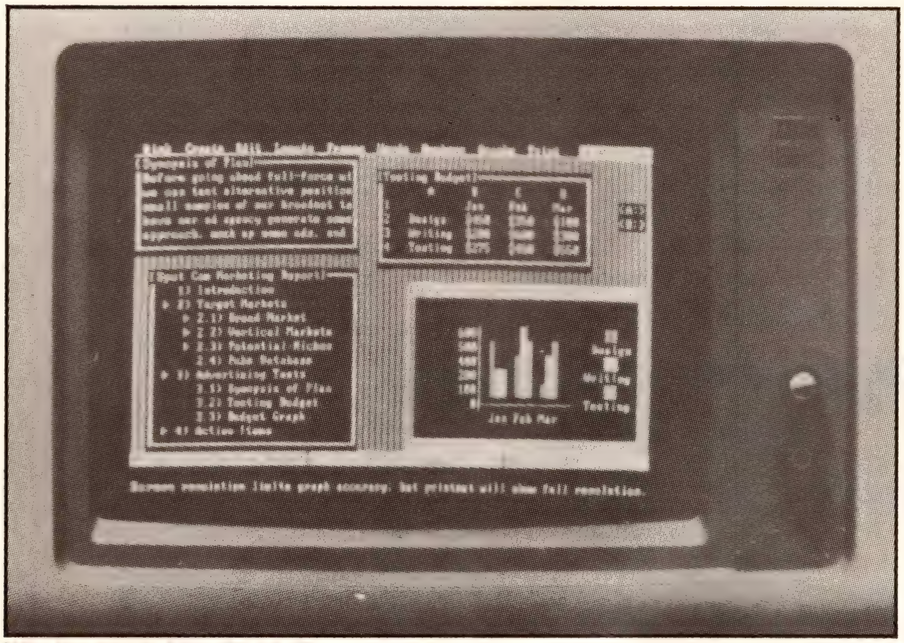
MCW6

I have a ____________ /No. computer
I have disc drive ☐ Yes ☐ No
I have a modem ☐ Yes ☐ No
Model: ____________________

Enter U018 on Enquiry Card



Windows in Ashton-Tate's Framework.

bought from third-party providers. "We already have a number of commitments from third parties that specialise in these type of templates," Carr said.

Carr claimed that Framework's spreadsheet recalculates faster than any other spreadsheet on the market except Lotus 1-2-3. "Sometimes we beat it — sometimes it beats us," he said. The number of spreadsheet cells is limited only by how much memory is in the hardware.

The package's file manager is less advanced than Ashton-Tate's most wellknown product, dBase II, but provides file management for such applications as mailing lists.

Forefront is a separate company doing development work for Ashton-Tate, but Ashton-Tate has a stock interest in Forefront and was the motivating force behind its creation.

"We expect Framework to do as well or better than dBase II," Julian Brantley, communications vice-president for Ashton-Tate, said. "There is an even bigger market out there for a productivity tool than a database."

He expects present dBase II users to buy Framework because the integrated package allows the user to pull dBase II files into it for analysis. "We think we have the next generation of integrated packages."

TI'S NATURALLINK TECHNOLOGY PACKAGE

TEXAS Instruments plans to market a programmer's tool that is based on the company's natural-language approach.

The framework for the natural-language interface was first released by the company in its NaturalLink communications package, which allows users to connect to the Dow Jones News/Retrieval Service. The programmer's tool, called the NaturalLink Technology Package, uses the same artificial intelligence concepts to let programmers develop and manufacture products that use the natural language (English in this case) of a built-in dictionary instead of cryptic computer commands or icons representing commands.

Products developed with the package would allow an individual to ask questions or issue commands by constructing a sentence from sentence segments that are displayed in different windows. The programs will alter the choice of windows or fragments available to the user on the basis of the "grammar" of the partial sentence as it is entered.

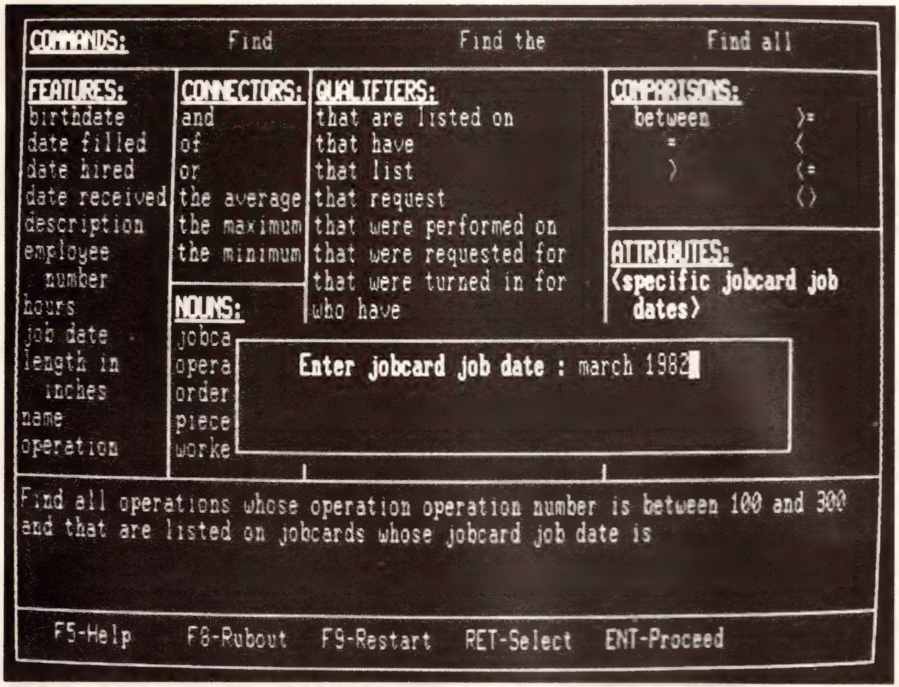
The Technology Package uses lists of verbs or nouns that sometimes continue past the window visible on the screen, thereby requiring scrolling. A few pop-up windows — including a help message — appear only when needed.

Built-in safeguards prevent the user from building sentences that are inconsistent with grammar rules — two verbs can't go together. A mouse can be used to select sentence parts. TI's NaturalLink designers passed by the use of icons in favor of lists of words or phrases that reinforce the availability of natural language.

TI itself plans to build new software packages from NaturalLink's framework and expects to announce several specific applications this year. The company is willing to train developers who buy the $US8000 package, and will collect royalties from any products that those developers create with it.

TI reports that a number of software developers have expressed interest in using NaturalLink as the base for designing specific products such as educational and business-office software, as well as for communicating with online databases. The clinical cardiology computer centre of the University of Alabama obtained the programming tool about three months ago for testing. University system manager Steve Wixson says NaturalLink will act as a natural-language interface to help physicians who are not trained on computers obtain data and view multidimensional images of the heart.

Although he is not a linguist, Wixson wrote the grammar for the cardiology centre's application. The



```
COMMANDS:        Find                    Find the                  Find all

FEATURES:       CONNECTORS: QUALIFIERS:                  COMPARISONS:
birthdate       and         that are listed on             between       >=
date filled     of          that have                         =          <
date hired      or          that list                         >          <=
date received   the average that request                                 <>
description     the maximum that were performed on
employee        the minimum that were requested for      ATTRIBUTES:
  number                    that were turned in for      <specific jobcard job
hours           NOUNS:      who have                       dates>
job date        jobca
length in       opera      Enter jobcard job date : march 1982
  inches        order
name            piece
operation       worke

Find all operations whose operation operation number is between 100 and 300
and that are listed on jobcards whose jobcard job date is

   F5-Help    F8-Rubout   F9-Restart   RET-Select   ENT-Proceed
```

Sentence segments in TI's NaturalLink package.

process involved writing and classifying the program's vocabulary, setting up the sentence structures with which users build enquiries, designing the screen and writing and debugging an application program.

The NaturalLink designers claim that programs using the natural-language system will be easy to learn. The system allows programs to be written in almost any language. For instance, a TI technician is using the Technology Package to design a program that will teach Korean to her daughter.

LOTUS' SYMPHONY

THE people at Lotus Development Corp knew all too well that their tremendously popular 1-2-3 would be a hard act to follow. Yet they have not only followed Lotus 1-2-3, they may eclipse it. Symphony, a new integrated package, squeezes word processing, data management, communications, spreadsheet, and business graphics programs onto a single 320K-byte disk. Symphony not only integrates five applications but does so with a windowing environment that rivals VisiCorp's Visi On.

Like Lotus 1-2-3, Symphony responds both to the novice's fumbling and to the imagination of a spreadsheet veteran who is comfortable with macros and sophisticated financial models. The package is flexible and expandable. Lotus has left open 10 interfaces to the program, so that software developers can link their programs (such as spelling checkers, other graphics packages, and the like) to Symphony and enhance an already sophisticated product.

The word processor includes advanced features such as automatic word wrap, global search and replace, and automatic pagination, plus boldface and subscript printing options. It also allows you to edit documents immediately (without a separate formatting step) when they are received via telecommunications.

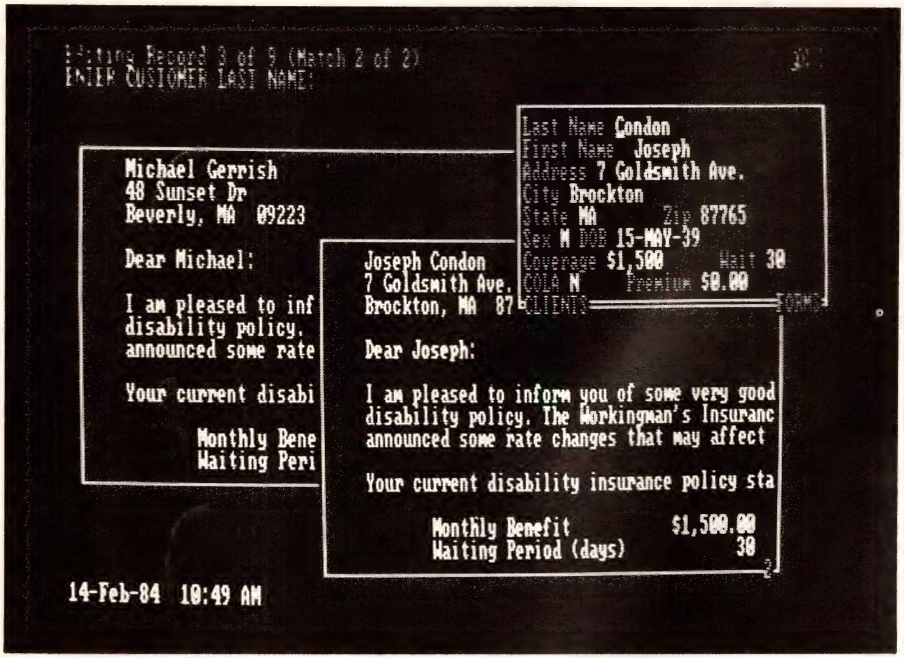
The data management system uses a simple, forms-oriented method of entering data and can store more than 8000 records. The data management features work in concert with Symphony's word processor to perform mail merge functions. The data management system's report generator can produce formatted output such as mailing labels, inventory reports, invoices and form letters. You can sort up to three data fields simultaneously. For example, you could retrieve and print all records filed under the surname Cohen from Massachusetts with the zip code 01776.

Symphony's asynchronous communications package includes terminal emulation (most ANSI-standard terminals and partial VT-100 emulation), point-to-point file transfer, and automatic dial and logon to remote computers. You can suspend a session, analyse the transmitted data, and immediately return to communications without breaking the connection.

With its 8192 rows and 256 cols., Lotus' spreadsheet successor to Lotus 1-2-3 is the largest spreadsheet available for the PC. Its most significant advantage over Lotus 1-2-3 is its ability to manipulate text as well as numeric information in spreadsheet models. The new spreadsheet can use most worksheets developed on Lotus 1-2-3.

Symphony's business graphics provides eight graph types, including shaded and exploded pie charts, area charts, open/high/low/close charts (for displaying stock market information), X-Y graphs, and line, bar, and stacked bar graphs.

Despite the package's seeming complexity, Lotus has made good on its promise to keep things simple. The word processor, for example, uses straightforward commands. The database automatically creates the basic file structure, requiring only that the user enter the list of items desired.



```
Editing Record 3 of 9 (Match 2 of 2)
ENTER CUSTOMER LAST NAME:

Last Name Condon
First Name  Joseph
Address 7 Goldsmith Ave.
City Brockton
State MA        Zip 87765
Sex M DOB 15-MAY-39
Coverage $1,500      Wait 30
COLA N     Premium $0.00
CLIENTS                    FORMS

Michael Gerrish
48 Sunset Dr
Beverly, MA  09223

Dear Michael:

I am pleased to inf
disability policy.
announced some rate

Your current disabi

        Monthly Bene
        Waiting Peri

Joseph Condon
7 Goldsmith Ave.
Brockton, MA  87

Dear Joseph:

I am pleased to inform you of some very good
disability policy. The Workingman's Insuranc
announced some rate changes that may affect

Your current disability insurance policy sta

        Monthly Benefit           $1,500.00
        Waiting Period (days)            30

14-Feb-84  10:49 AM
```

A Symphony screen with three windows.

The help file contains more than 200 information screens. Since this 320K-byte program resides entirely in user memory, Symphony is extraordinarily fast and efficient.

But the real power of Symphony is in its integration capabilities and its overlapping windowing environment. Tables or database information can be inserted easily into documents prepared with the word processor.

Changes to one window will automatically update windows from other applications that are affected. At a demonstration of Symphony I attended, stock market figures coming in over a modem were displayed in one window while a portfolio displayed in another was automatically updated. With a couple of easy moves, a third window could be set up to represent the changing figures graphically.

Symphony was scheduled for shipment in June and will carry an introductory price of $US695. For $US200, registered Lotus 1-2-3 owners can trade in their package for Symphony.

MICROPRO'S CORRECTSTAR

MICROPRO International took advantage of the West Coast Computer Faire in the US to announce its first public stock offering and to herald the arrival of a new spelling checker that may become a "watershed development" for the California company.

The manufacturer of the popular WordStar word processing program announced a public offering of 2.2 million shares. Company spokesperson Tom Hacker said the stock was first made available for over-the-counter trade at $US10.50 a share under the name MPRO.

The company also unveiled CorrectStar, a $US195 program that Hacker said is "a step toward artificial intelligence that isn't remote from people's everyday lives".

The program is the result of the joint talents of MicroPro and the Houghton-Mifflin Company, the Boston-based publishing house and lexical authority, which Hacker said did exhaustive research to compile the best words for the product's 65,000-word dictionary.

Among other things, Houghton-Mifflin's "computational linguists" researched what they claim are the 99 per cent most-used words in the English language as determined by frequency studies. CorrectStar uses these words, along with its 1500-word personal dictionary, not only to find incorrect spellings of words, but also to make suggestions to the user about what might be correct.

The program's user interface displays a command menu on the screen at all times. You can toggle back and forth between it and WordStar as desired.

In a brief trial with the product, the word "faseeshus" was entered, CorrectStar found the error, highlighted the text and immediately suggested "facetious". When the word "showfer" was entered, the program came up with "shower," "shofer" and finally "chauffeur" as the correct spelling.

How does the program do it? "Those are proprietary algorithms developed by Houghton-Mifflin," Morris Jones, the MicroPro programmer who was responsible for CorrectStar, said. The algorithms allow the program to flag a high percentage of misspellings in text and offer accurate corrections to users, he said. Houghton-Mifflin used the American Heritage Dictionary as the source for the CorrectStar dictionary. "We tried going up to 75,000 words, but some weird things started happening."

MicroPro has already launched a $US2.2 million advertising campaign for CorrectStar and is planning Secretaries' Week promotions and a supermarket-style contest. "We're going the whole hog with CorrectStar," Hacker said.

CorrectStar is only available for the IBM PC. MicroPro plans to make its main spelling checker in the 16-bit format. Formats for the Tandy Model 2000, Dec Rainbow, TI Professional and other MS-DOS-compatible computers are scheduled for release soon.

The company's other spelling checker, SpellStar, will continue to work with 8-bit machines. People with 16-bit machines and SpellStar will be able to upgrade to CorrectStar for $US85.

MICRORIM'S RBASE CLOUT

AMERICAN software manufacturer MicroRim has added a natural language interface to its R:base series of relational database software said to allow users access to information using plain English commands.

Billed as the first microcomputer package with artificial intelligence components, R:base Clout has a built-in dictionary of 200 words and allows users to build on that dictionary with synonyms for words associated with the database.

Users build the vocabulary by querying the computer with a word or series of words not already in the database vocabulary. Clout responds with questions to direct the user to define the unfamiliar terms.

In this way, if the database included a field of data titled "jobs," users could construct a definition for "occupation" or "work" to mean the same thing, the company said. All three words would be interchangeable when a database is queried about jobs.

The interface can search through and retrieve records from the database based on adjectives or qualifying terms. For example, users could ask the database to show the top three salesmen in orders for the past year. Users could also request the database to list all employees with above average salaries along with their birth-dates, the company said.

MicroRim president Wayne Erickson thinks Clout's most valuable asset is in letting users define words that are the result of computation or data manipulation. In situations where users need to know what the profit is for a particular period when "profit" is not a term in the database, users could define "profit" as "sales minus expenses" to get the answer.

R:base Clout will be sold through retailers, software-only stores, and OEMs for $US195.

EPSON'S PX-8 PORTABLE

MICROPRO International's announcement of chip-based software for the Epson PX-8 lap computer promises to kick the company's popular WordStar word processing program out of the office and into the streets. (There are already about a million users of MicroPro's disk-based WordStar product.)

Portable WordStar on a ROM chip will be about the size of a matchbook and will slip into the back of the machine. Two other ROM-based programs from MicroPro are a 64-column by 256-line spreadsheet called Portable Calc and a scheduler called Portable Scheduler.

The Epson PX-8 has not only an 8-line by 80 character LCD, but offers CP/M compatibility, a 32K-byte operating system ROM, a 64K-byte RAM that is expandable to 184K-bytes, a built-in microcassette recorder and a full set of onboard ROM and cassette-based software — all for $US1200. MicroPro, without any publicity, showed this machine with ROM WordStar and CalcStar installed.

All three programs will be shipped with the PX-8 scheduled for introduction later this year. But the popular word processing program's shift from desk to lap is really the stellar achievement of MicroPro's venture with the new Epson computer. To achieve it, MicroPro International called in WordStar's original author, Rob Barnaby, to help shave down the program's lengthy code.

"The major challenge was for Rob and me to retain nearly all of WordStar's functionality and interface in a code that's only 32K-bytes long," said Rick Meyer, senior product manager at MicroPro. "Luckily, by very careful pruning of messages and code tightening and sacrifice of some less-used features, we got by with very few changes."

Those changes involved not including paragraph or decimal tabs and not including a directory within the program. When users need a directory, they must exit to the operating system — in this case, CP/M 2.2 — and call for a directory from within the operating system itself.

Scrunching the program into a ROM product also brought about other changes. "We put in some new algorithms so it could be used in the novel architecture, especially because of the slowness of the LCD screen," said Meyer.

"We had some problems. WordStar uses 'what you see is what you get' features like constant onscreen justification, word-wrapping, scrolling, and so on. We really had to turn handstands in the code to allow users to type at high word processing speed and still maintain the image on the screen."

The Epson project marks MicroPro's first venture into what Meyer calls a "new form of integration" between notebook-size and desktop computers. The two versions of WordStar, for example, have the same user interface and same data file format, Meyer said. A transmit/

Epson PX-8 lap computer — ROM-based software.

receive function sends data back and forth between desktop and lap computer either via a modem or via a cable hooked up to the computers' RS232 ports.

"It's logical," Meyer said. "We find it hard to believe that the user of a notebook computer is willing to learn entirely different behavior or cut-down programs (on lap computers) from the ones they use on their desktop computers."

The portable Calc program is not the same as MicroPro's desktop spreadsheet, CalcStar, but Meyer said the two share the "same kind of relationship as the two versions of WordStar. Portable Calc behaves very much like a familiar spreadsheet.

Meyer said it is "hard to answer" whether ROM-resident software on lap computers could cause a decline in the use of floppy disks. "For short documents, such as memos and letters, it's more reliable than electromechanic floppy disks," he said, adding that longer documents would always need larger storage capacities. "We see it as a companion to WordStar 'Senior,' not as a replacement."

Meyer said MicroPro is working on adapting the ROM-chip concept to the upcoming generation of 16-bit, MS-DOS lap computers. The 8-bit, CP/M-based Epson PX-8 machine was recently introduced at the Hanover Fair in West Germany as a preview to its sale in European markets in coming months. It will be available in the US later this year.

MICROSOFT'S MICROSOFT PROJECT

MICROSOFT has taken another step toward its goal of "a finger in every pie" with its latest application program, Microsoft Project.

Project, announced at the West Coast Computer Faire in San Francisco, was expected to be shipped in "late May or early June," according to marketing manager Rob Glaser. Microsoft will target the program's sales to business managers and professionals who have probably not used project-management software before.

"It's not clear that people would pay that much for a new productivity tool," Glaser said of the higher-priced programs.

"There has to be an entry point that people can come up with," he said. "We priced Project at $US250 because it's a generic productivity tool, and that's where we priced the rest of our applications."

Glaser said the initial release of Project will be for the IBM PC only, and will only be sold on a retail basis.

The program uses a spreadsheet-like screen style and Gantt chart display, and can generate simple graphical schedules that you can transfer to paper. Unlike most project managers, the number of scheduling activities that Microsoft Project can handle is unlimited.

Project has a built-in facility to generate and print different kinds of "canned" reports, according to Microsoft literature, and it has the same user interfaces as Microsoft's Multiplan, Chart and Word. The progam has the optional ability to use the Microsoft mouse as well.

Microsoft has also made the program usable with other software, including Lotus 1-2-3, dBase II and many word processors, including WordStar and Multimate. This means that you can transfer data between Project and these programs without re-entering it.

Project has an on/off switch for recalculation, display color options and Help screens appropriate to the operation in progress. The program also uses a "layering" approach, which Glaser said allows users to get to whatever information they need in whatever amount. Project allows users to scroll through the schedule and focus on specific aspects.

Project has multifunction capabilities, including in-depth resource calculation, which allows users to create schedules with any level of detail. Users can break figures down in any increment they desire or leave them alone completely.

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commodore
executive computer
SX-64

Commodore is the public face of microcomputing. The company cornered the Australian home market with the Vic 20 and then the 64.
Now it is pushing into the business market with the portable 64, the SX Executive.
Neville Angove looks at the machine and Ian Webster reviews the software offerings which are designed to make the 64 into a business portable.

Because the Commodore's Keeping up With...

THE Commodore 64 was one of the most carefully designed microcomputers since the Apple *III*. Commodore wanted to maintain some compatibiity with the Vic 20, particularly with the peripherals, and the older family of PET and CBM systems. The company also wanted to put a $500 computer on department store shelves, competing with computer outlets offering similar features but at greater expense.

The Commodore 64 succeeded in overturning the home computer market, but lacked the image associated with machines designed for professional use (even if such systems were less powerful). It also lacked the simplicity of integrated systems: a fully-featured C64 required a dozen separate modules and what appeared to be a hundred metres of connecting cables. At a time when portability was becoming an increasingly important feature, the C64 was not even in the running.

The Commodore SX-64 addresses most of the complaints levelled at the C64, but is still virtually the same machine in a more convenient (and professional) packaging, running the same readily available software.

The SX-64 is (when laid flat on a desk) 42cm deep, 37cm wide, and only 13cm high. The standard Commodore keyboard detaches from the front of the machine, and the carrying handle can be used as a stand to raise the front of the system to a more convenient height.

To the left is a 12cm color screen, displaying blue letters (40 characters per line, 25 lines per screen) on a white background. Although the display is small, the image is as clear as that generated by the C64 on the home television screen. To the right of the display is a single disk drive, with the storage for disks above. The right-hand side of the drive has five controls for the display.

On the top of the unit, toward the rear, is a cartridge socket. The bottom of the SX-64 (or the back, if it is being used) has ports for joysticks, a serial port, an audio-visual connector and an expansion port. This is also where you will find the power socket and the on/off switch.

The inside of the SX-64 is a marvel of manufacturing. The main processor board runs along the right side of the machine, starting just behind the display controls. The video display controller occupies the corresponding position on the left of the case, butting against the power supply. The cartridge socket sits behind the disk drive, and between that and the board holding the connectors are two other boards, one of which may be the drive controller.

Right in the middle of the box, next to the cartridge socket, is a speaker that is larger than found on most personal computers. Because of the manner in which the case attaches to the backplane, I could not disassemble the bottom of the machine to see what wonders might be hidden there without risking the (permanent) detachment of some of the cables.

There is no fan, with heat being dissipated via the backplane (which is designed to act as a heat sink) or through ventilation holes along both sides of the case.

Because I could not positively identify the drive controller, I am not sure that it still uses the traditional Commodore GP-IB interface but, since additional drives can be attached through the expansion interface, it would seem to be the case. The drive was slow enough to support this conclusion.

The processor in the SX-64 is still the venerable 6502, now a bit long in the tooth, but guaranteeing software compatibility with the rest of the Commodore line.

Quite apart from the compactness of the package, there is no advan-

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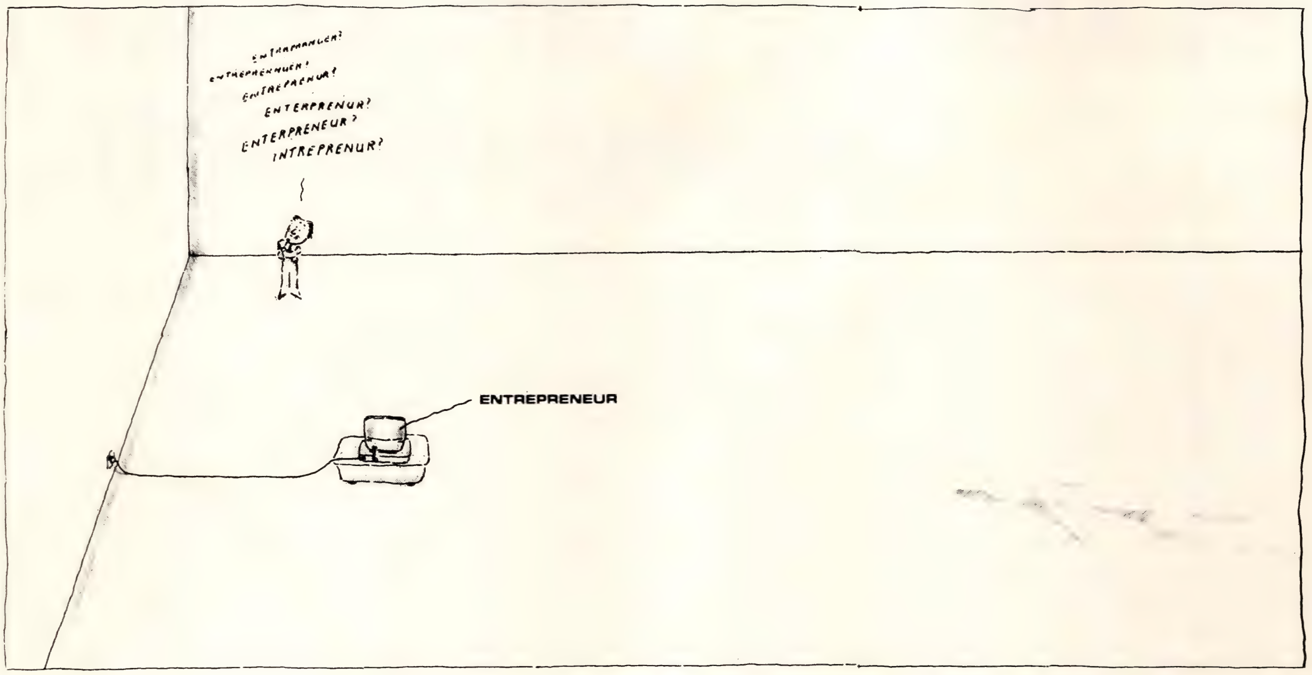
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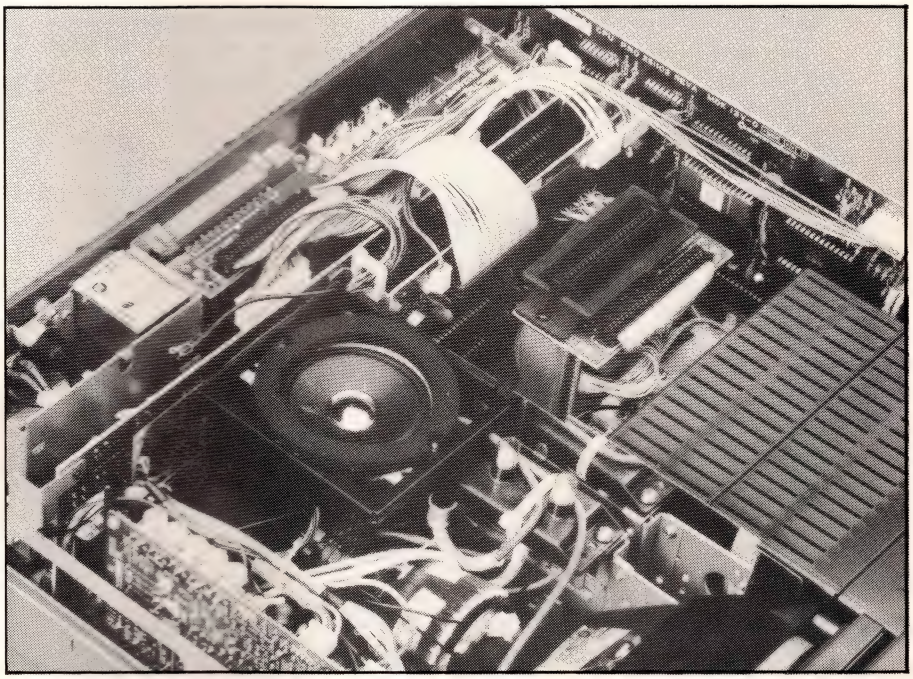
tage to the SX-64 over the C64. In fact, current pricing puts the SX-64 at a disadvantage. The software seems to run the same way, at the same speed, the peripherals are still available, and the quality of workmanship is unchanged.

What has changed with the SX-64 is Commodore's marketing approach. While the SX-64 is no lightweight, it is easier to lug around than the current crop of portables, and provides all the facilities a user needs for a reasonable attempt at personal computing in the one package, with only a built-in printer missing.

The advertising stresses the portability and the professional value of the SX-64: the system is seen being used at the side of a swimming pool and in a busy office. The hardware package is good enough for effective use in both situations; is the software as versatile?



The interior of the Executive is a marvel of manufacture.

SOFTWARE

The usefulness of a portable computer depends on available software. Most portable computer users want to use standard applications software: word processing, data management, spreadsheet and communications.

Specialised software is sometimes needed to support an application where information needs to be collected and added to an existing database. This software is usually based on an existing data management package or written in Basic.

Commodore made a big effort to ensure that a wide range of software was available for the Commodore 64. The company produced its own, marketed as the Easy series, covering most standard applications. It encouraged programmers to convert their software from the older CBM 4000 and 8000 computers to the C64.

Because these earlier Commodore computers were successful in the UK and European markets, much of the software reflects these origins. UK programs tend to be clever and sophisticated but with less attention paid to the development of the user interface. US programmers, on the

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other hand, tend to develop sophisticated user interfaces on top of a standard package.

Commodore's word processor for the Executive is Easyscript, written by Simon Tranmer, a member of the UK's leading Commodore user group, ICPUG. Tranmer developed the word processor in response to two other word processors, taking the best from each one.

The first, WordPro, was a screen-based text editor with easy text entry and modification. The second was Wordcraft, a secretarial word processor with many formatting features.

Easyscript has the easy text entry of WordPro combined with the formatting features of Wordcraft. The program is loaded with features and is capable of using all features of Commodore's printers.

The small screen and text-editor approach make the program tiresome to use for extended periods, but it is entirely adequate for producing small reports, letters and keeping notes, which is the extent of most portable computer use. A spelling program called EasySpell is available from Commodore with a 20,000 word dictionary that can be modified.

Several other word processing packages are available for the Commodore Executive. Some are cartridge based and, while easier to use, do not have Easyscript's features or performance.

Superbase 64 is also a Simon Tranmer program. It is possibly more powerful and sophisticated than any other data management program available on a low-cost, popular personal computer. Originally developed for Commodore's 4000 and 8000 series with their large capacity disks, the power of Superbase is unlikely to be used in Commodore Executive applications.

Superbase 64 can support up to 15 databases, each based on a user-designed input form that can be up to four screens long. Although only one key field is supported, a wide range of search and ordering commands is provided.

Reports with all of the standard formatting features can be produced.

Information can be taken from any of the 15 databases and combined into one report. A programming language designed to automate batch updates and production of reports is also included.

Superbase 64 should satisfy all your data management needs, with the only restriction being the capacity of the Executive's disk drive which would restrict a database to about 400 records and inhibit the generation of alternate index lists and the use of multiple databases.

Microsoft's Multiplan is a popular spreadsheet for Apple and IBM PC computers. Last year Microsoft released a low cost version of the spreadsheet for the Commodore 64 through Human Engineered Software, a company noted for user-friendly, finely finished and well-documented products.

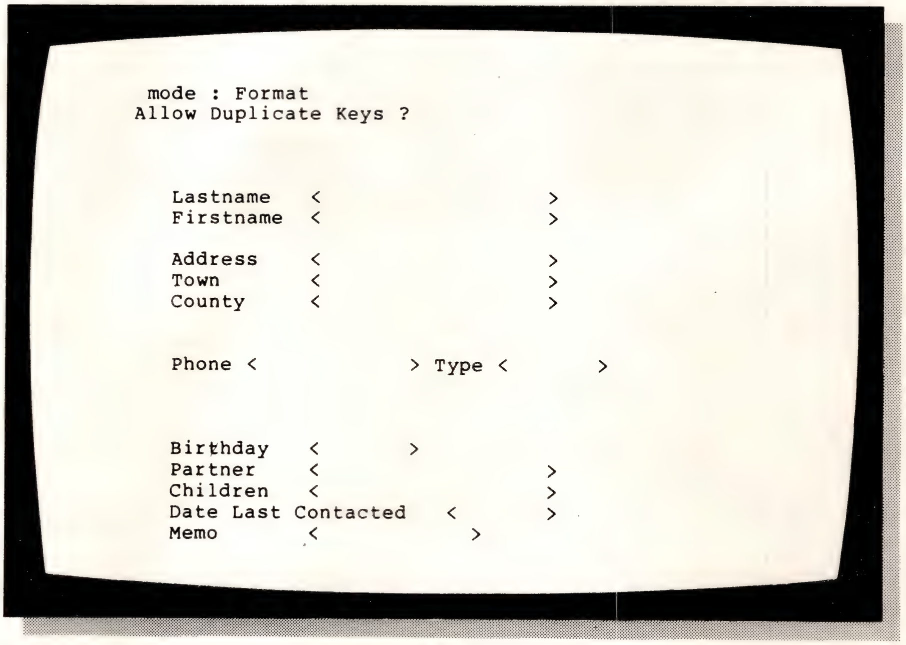
Multiplan is probably the most sophisticated product available for the C64. It comes with the exhaustive 422-page manual and all the features that make the product successful on the IBM PC.

For those who have a Commodore 64 and need to perform complex spreadsheet calculations, Multiplan provides a lot of power for a small price. Multiplan, one of the newer generation of spreadsheets, allows you to enter data and calculate by moving around the cells on an imaginary "page" that is much bigger than your computer's screen. As well as these basic features, Multiplan allows you to name an area of the spreadsheet, and then refer to that area by name in future computations. You can link named cells in two spreadsheets, so that changes in one spreadsheet will automatically update related ones.

Cell contents, or merely their formulas, can be "locked" to ensure that a user will not alter a spreadsheet's format. Multiplan also supports multiple windows, allowing display of several areas of a spreadsheet at once, although the 40-col screen on the C64 restricts this feature's usefulness. Windows can be locked together so that they scroll parallel to each other.

Unlike the first-generation spreadsheets, Multiplan displays your command options as words, not initials, that are constantly displayed at the bottom of the screen. To activate the functions, you move the cursor until it highlights the word, and then press the Return key.

Most commands require you to answer several questions, which are displayed in the bottom part of the screen under the spreadsheet. The questions are clearly written, and lead you through the creation of



```
   mode : Format
 Allow Duplicate Keys ?



     Lastname   <                   >
     Firstname  <                   >

     Address    <                   >
     Town       <                   >
     County     <                   >


     Phone <            > Type <       >



     Birthday   <       >
     Partner    <                   >
     Children   <                   >
     Date Last Contacted     <      >
     Memo       <            >
```

Superbase data entry screen on the SX-64.

sometimes-complex command sequences.

An extensive online Help file is available at any time by striking the Help key. The screen will automatically display the instructions for any function in use. Alternatively, you may specify that you want to look at any particular Help text.

You may use the Commodore function keys for some common operations such as delete, and word left or right, or character left or right movements. HES provides a card that fits over the function keys.

Multiplan's performance is generally good, especially during calculations. But it seems as if the program takes forever to load from a Commodore 1541 disk. Just about the time you begin to fear that your disk drive is defective, the program appears on screen. Saving and loading data for the spreadsheet are also slow.

Other performance quirks exist. After you quit the program, Multiplan leaves the computer's operating system temporarily crippled. To use the disk drive again, you must turn off the computer and the drive.

Two disk drives can be used simultaneously, however, if you change the device number of the second one. The printer must be compatible with the Commodore 1545. This lack of flexibility may restrict business users who want to use the faster CBM drives or more sophisticated printers.

Multiplan is not easy for a casual user. Its many advanced features and sometimes Byzantine command structure require considerable practice for any but the simplest operations.

A number of other spreadsheets are available. The most interesting is the Swedish-designed Calc Result, offering consolidation across 32 spreadsheets. On the Executive, Calc Result is probably a better spreadsheet than Multiplan because of its flexibility.

A communications program is the other necessary application for a portable computer. Communications programs that enable users to connect to another computer are available in the public domain or from Computer Classics, which offers a program for less than $20.

Computer Classics also offers a range of low-cost acoustic and direct connect modems suitable for use with the C64. These come with or without an RS232 interface.

If you want to upload or download files, a more sophisticated program is necessary. Computer Classics has a program suitable for use with the Australian Beginning for less than $30. Nick Gammon and Sue Cobbit, developers of the popular G-Pascal program, include a sophisticated communications program with every copy of G-Pascal that should satisfy most users' needs.

Few application packages are available for the C64, with most users adapting a database package to their needs. Computer Classics has just released a series of specific application packages, developed by Adelaide Commodore dealer, Abraxas. Each package, costing $69.95, includes a filing system which uses screen-based index cards and an integrated word processor that can be used to produce reports and letters using information in the file.

There are eight applications, all of interest to portable computer users. They include: the collector, the repair shop, the client file, the auto dealer, the roundsman, the stock file, the membership manager and the sales representative. Each package is based on the same file/word processing program but modified to suit the particular application.

Sydney-based software house South Pacific Software has also released an extensive range of software that includes a number of applications packages.

Commodore will release low cost accounting software called the Meridian series developed in New Zealand, later this year.

Of course a vast selection of games and entertainment software is available for the Commodore Executive. Most of the popular classics are available at a lower cost than for other personal computers.

A range of low-cost software is available for the Executive that, given the speed and capacity constraints of its disk storage, should satisfy users who want a portable computer for casual use.

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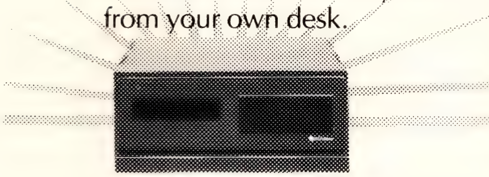

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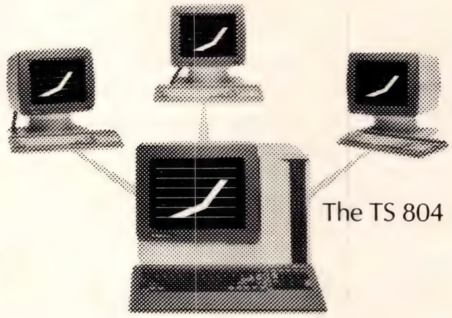

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More is known about Apple's operating system than any other program. Programmers have learned to circumvent DOS whenever speed, capacity or I/O control have been important. Apple's release of ProDOS for the Apple II is a great leap forward. Peter Watson says try it, you'll like it!

ProDOS:
By DOS out of SOS

PRODOS is Apple Computer's new operating system for Apple *II* microcomputers. It is faster, more flexible, and can use much larger files and disk drives than DOS 3.3. It is compatible at the file level with the Apple *III*'s SOS and a disk can be configured to boot on either system!

ProDOS comes in two parts. When you boot a ProDOS disk, a bootstrap program on the disk looks for and loads a file called PRODOS. This is the code that handles the disk operations corresponding to the RWTS and File Manager portions of DOS 3.3. It also supports interrupts and a clock card.

When loaded, it relocates itself up into the language card, leaving behind a single page (256 bytes) at $BF00. This System Global Page is a collection of entry points and data areas which will remain constant across releases of ProDOS. The location of ProDOS in high memory means you have almost 46K-bytes available for machine code programs, but you must have either a *II*+ with a 16K-byte card or a *II*e.

When ProDOS has finished initialising, it looks for and loads the first type SYS file (one of several new file types) with a name ending in .SYSTEM, normally BASIC.SYSTEM. This is the BASIC-to-ProDOS command interface that accepts commands from the keyboard and interprets Ctrl-D commands from a program.

Was that a groan I heard from the audience? Yes, you still have to prefix ProDOS commands with the infamous CHR$(4), but there is some good news. As long as the first character in the PRINT statement is a Ctrl-D, it no longer matters where on the screen you print the command. This means the Applesoft TRACE command will now work properly in conjuction with ProDOS commands.

BASIC.SYSTEM resides between $9600 and the System Global Page and has its own Basic System Global Page at $BE00. It completes the booting process by looking for and executing a file named STARTUP of any type — it will be RUN, BRUN or EXEC'ed as required. If it doesn't find one, a title message is printed and you are neatly deposited in Basic — no more File Not Found errors.

BASIC.SYSTEM is the part of ProDOS that will interest most people. Apple has maintained a high degree of compatibility with DOS 3.3, while adding several new commands and extensions. But some commands have disappeared.

DELETED COMMANDS

The MON and NOMON commands have gone (NOMON is accepted, but ignored). It appears that one reason for DOS 3.3's appalling slowness with text files was support for the MON I command, which meant that each byte in a text file had to be handled individually. Under ProDOS, this and other changes mean text file processing is much faster.

MAXFILES will also be ignored. It is unnecessary to allocate file buffers, as ProDOS dynamically allocates them as required. There is a limit of eight files open at once.

The FP and INT commands have gone, as BASIC.SYSTEM requires Applesoft in ROM. Although Integer Basic is theoretically supported, Apple has not released a ProDOS version since its old home in the language card has been appropriated by ProDOS.

INIT will not work. Its function has been moved to the FILER (the equivalent of FID). The reason for this is that ProDOS will allow you to attach several types of disk drives (including the 5M-byte Profile hard disk), each of which requires its own formatting routine.

This means a Basic program can no longer easily offer to format a disk for a user. On the brighter side, a newly formatted ProDOS disk does not contain the operating system files, and is almost 100 per cent usable for program and data storage.

One advantage of separating the formatting function is that it can be expanded. When a Disk II diskette is formatted, a speed test is performed. If the speed variation is not within certain tolerances, the format fails. A message asking you to have the drives adjusted is displayed. While this may be a nuisance at times, it means that, if you write a disk, someone else can read it.

CHANGED COMMANDS

The CATALOG command comes in two variations. The CAT command gives a 40-column directory listing similar to the DOS 3.3 CATALOG command, while CATALOG gives an expanded 80-column listing. More on these later . . .

The RUN command now has a parameter to specify the starting line number (the @ parameter, for 'at'). You have always been able to do this with the program in memory, but not with one on disk. The command looks like:

```
RUN FRED, @100
```

The BSAVE command has gained the E parameter, which specifies the end of the memory block to be saved. The LOAD, SAVE, and BLOAD commands are unchanged, except that they move data up to eight times faster — faster than most of the current fast DOS programs.

The PR# and IN# commands have been changed in two ways. First, if they were issued in a Basic program under DOS 3.3 without the Ctrl-D, DOS was disconnected. Under ProDOS, they will be ignored. Second, if you want to send output via a program residing at, say, $300, you can issue the command PR#$300.

You can also use a form of phantom slot assignment by issuing a command such as PR#1,$300. This has the effect of making any later PR#1 statements equivalent to PR#$300, and is effectively a simple form of I/O redirection.

Since Apple decided that most people used the VERIFY command only to check for the existence of a file, that is the only part of its original function that survives.

NEW COMMANDS

The first new command is '—' (pronounced 'dash', as in 'faster than RUN'). To execute any type of file named FRED, enter:

```
'—FRED'
```

and ProDOS will RUN, BRUN or EXEC program FRED as required.

The CHAIN command is now properly implemented. To execute another Basic program while retaining all the current variables, simply issue a command such as:

```
CHAIN FRED, @100
```

(CHAIN also has the @ parameter). Functions will not work after CHAIN, the reason being that CHAIN remembers the function name, but the pointer to the function expression points to a location within the original program, which has been overwritten by the new program.

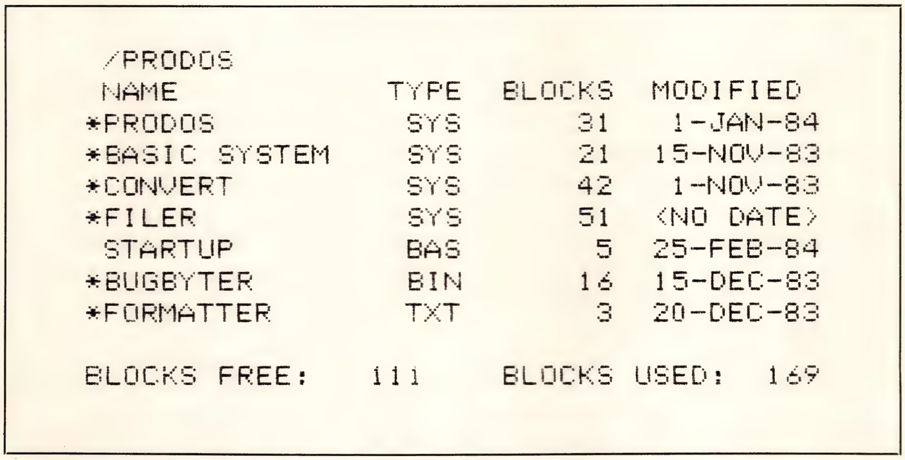
Two useful new commands are STORE and RESTORE. These complementary operations are related to Applesoft's STORE and RECALL cassette commands, which were rarely used because of their limitations. As ProDOS commands, they have gained real teeth.

For example, STORE FRED will save the values and names of all variables, arrays and functions in a file of type VAR named FRED. Later, the program can be reloaded, the command RESTORE FRED issued, and execution continued with the variables in the same state as when the STORE command is issued. This works even if the program has been modified (except for functions, for the same reason as with CHAIN).

Because ProDOS dynamically allocates file buffers, it must relocate HIMEM — which means moving Applesoft's strings. Before the strings can be moved they must be compacted by a process called garbage collection. Under Applesoft, this might take up to 15 minutes.

To avoid this delay, a new garbage collection routine has been written for ProDOS. To explicitly call this routine in a progam, you use the FRE command (without parameters).

Is it worth using? Well, the longest garbage collection the ProDOS development team have timed took



```
 /PRODOS
 NAME                 TYPE  BLOCKS  MODIFIED
*PRODOS                SYS      31    1-JAN-84
*BASIC SYSTEM          SYS      21   15-NOV-83
*CONVERT               SYS      42    1-NOV-83
*FILER                 SYS      51   <NO DATE>
 STARTUP               BAS       5   25-FEB-84
*BUGBYTER              BIN      16   15-DEC-83
*FORMATTER             TXT       3   20-DEC-83

BLOCKS FREE:    111     BLOCKS USED:   169
```

Figure 1: Directory listing from CAT command.

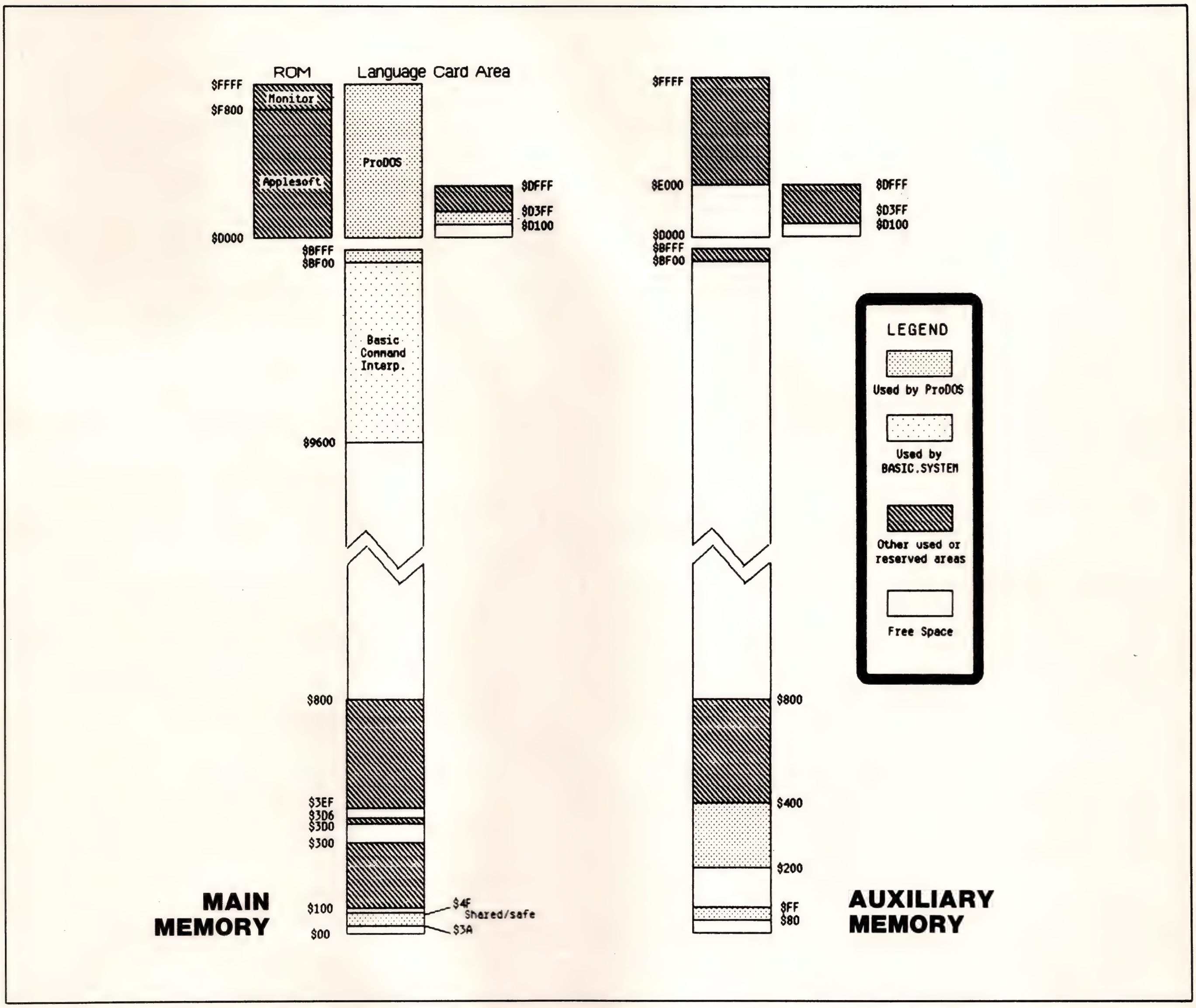


Figure 2: ProDOS memory map.

2.5 seconds and, in most cases, there isn't even a noticeable pause! Applesoft garbage collection is still active (if that's the right word), so you must issue the ProDOS FRE command before Applesoft steps in, otherwise the old, slow routine is used.

The new text file command is FLUSH. ProDOS handles data in 512-byte blocks. When writing data to a file, it is only physically written to disk when the buffer is full, leaving a lot of data in buffers waiting to be written.

The FLUSH command forces ProDOS to write the data to disk so that, if the power fails or a program crashes, the data will have been saved on disk. CLOSE does an implied FLUSH (as under DOS 3.3).

The last new commands are PREFIX and CREATE, which I will explain when I discuss subdirectories and pathnames.

DIRECTORIES

Let's look at directory listings. The display obtained with the CAT command is shown in figure 1.

This is fairly recognisable, consisting of the name of the disk volume (/PRODOS), a legend line, several directory entries (with locked files flagged by an * symbol) and a free space count. Each directory entry has the date of the last modification (obtained from a clock, or the global page if set manually).

File types are now three character mnemonics. There are 256 possible file types (although many are reserved for future use) and most of the rest do not even have a mnemonic. They are simply displayed as, say, $F1.

Figure 3 shows the result of a CATALOG command.

The creation date has been added, along with the times of creation and last modification. ENDFILE is the length of the file in bytes. The last field is SUBTYPE, the contents of

```
]CATALOG

/PRODOS
 NAME          TYPE  BLOCKS  MODIFIED         CREATED          ENDFILE SUBTYPE

*PRODOS         SYS      31   1-JAN-84  0:00  <NO DATE>          15360
*BASIC.SYSTEM   SYS      21  15-NOV-83  0:00  <NO DATE>          10240
*CONVERT        SYS      42   1-NOV-83  0:00  <NO DATE>          20481
*FILER          SYS      51  <NO DATE>        <NO DATE>          25600
 STARTUP        BAS       5  25-FEB-84 16:40  <NO DATE>           1815
*BUGBYTER       BIN      16  15-DEC-83  0:00  <NO DATE>           7177 A=$2000
*FORMATTER      TXT       3  20-DEC-83  0:00  20-DEC-83   0:00     764 R=    0

BLOCKS FREE:  111    BLOCKS USED:   169    TOTAL BLOCKS:   280
```

Figure 3: Result of a CATALOG command.

which depend on the file type. For BIN files, it contains the load address of the file. (Since the address and length are kept in the directory entry, they are no longer the first four bytes of a binary file.) For TXT files, it contains the record length of a random-access file, or zero for a sequential file. For other file types it is presently undefined.

The maximum filesize (if the volume is big enough) is 16M-bytes, while a volume may hold 32M-bytes. The physical volume size is not always a restriction. A random-access file of 2000 records of 256 bytes each might take only 20 blocks on disk, since ProDOS does not allocate space for unwritten records. An unwritten record is read as all zeros.

SUB DIRECTORIES

An advantage of ProDOS is that it allows the use of disk drives other than the old faithful Disk II. The Profile fixed disk can be used and I will be surprised if the Macintosh's 3½in drives are not made available soon. One reason these larger capacity drives were not implemented under DOS 3.3 was the problem of directories.

Earlier, I mentioned directory (DIR) files, which are a new concept for Apple *//* users, although SOS, Unix and MS-DOS users are familiar with them. The directory structure under ProDOS works as follows. There are four blocks on track 0 which correspond to the catalogue of DOS 3.3. This Root Directory, however, will hold only 51 files — a compromise between providing enough directory space for a fixed disk and not wasting space on a diskette. This limitation was overcome by allowing dynamic directory sizing using files as extra directory space. The number of files in a subdirectory — and the number of subdirectories — is limited only by the amount of disk space.

There are other problems. If a fixed disk contains, say, 2000 files, can you imagine having to scroll through them every time you catalogue a disk? Or the performance overhead of searching the directory each time a data file is accessed? To overcome these problems, the directories are set up in a tree structure and accessed via their filenames. Let me give an example.

PATHNAMES

We have a volume called /USER (volume names begin with /), which is actually the name of the root directory. /USER contains the Basic program PROG.A. To access it, we use the name /USER/PROG.A. That is, we refer to its directory then its filename, separated by a /. This is the pathname of the file.

Under ProDOS, the term pathname is normally used in place of the DOS 3.3 term filename. To execute PROG.A, we would enter the command:

```
—/USER/PROG.A
```

```
          __ PROG.A               __ DATAFILE.1
         <__ DATA.A (dir) ---<__ DATAFILE.2
/USER ---<__ PROG.B               __ DATAFILE.1       ___ DATAFILE.2
         <__ DATA.B (dir) ---<__ DATA.C (dir) ---<___ DATAFILE.3
```

Figure 4: Directory structure showing file and path names.

We decide that we want to keep the data files for this program in a separate directory. First, we must issue the CREATE command to build a (sub)directory file:

```
CREATE DATA.A
```

This creates a file of type DIR (by default; it can create a file of any type by using the T parameter, such as CREATE FRED, TTXT). Next, we tell PROG.A to create a data file called DATAFILE.1 in the new directory with the Basic command:

```
OPEN/USER/DATA.A/DATAFILE.1
```

(Volume/Subdirectory/Filename). If we later reopen the file, ProDOS will search for that pathname in any drive, even if we moved the disk since it last looked! The slot and drive parameters are still valid, but are usually superfluous.

The syntax for pathnames is more restrictive than for DOS 3.3 filenames. A file or volume may consist of up to 15 letters, numbers and periods (.) only — no blanks. The maximum length of the pathname is 64 characters, including the / separators.

By now you are probably worried about wearing out the keyboard with these long pathnames. Worry no more, the PREFIX command is here to save us. By entering:

```
PREFIX/USER/DATA.A
```

we can now refer to the data file simply by using its filename DATAFILE.1. When ProDOS is initialised, it sets the prefix to the name of the volume that it was executed from. This means a converted DOS 3.3 program can access the root directory automatically. The current prefix can be determined by issuing the PREFIX command without operands.

Let's assume we have created several more files and subdirectories. The resulting directory structure can be seen in figure 4. Although there are apparently duplicate FILE names for the data files, they actually have different PATH names, such as /USER/DATA.A/DATAFILE.2 vs /USER/DATA.B/DATA.C/DATAFILE.2

```
JSR   MLI          ;at BF00, a vector in
                   ;  the System Global Page
DB    CMDNUM       ;a number representing
                   ;  the type of call
DW    PARMLIST     ;address of the parameter
                   ;  list for this call
BCS   ERROR        ;branch to an
                   ;  error-handling routine
```

Figure 5: Call to the machine language interface.

Subdirectories have several side effects. First, there is a performance overhead in accessing subdirectory files. Although not as bad as for a single large directory, it is still noticable, which suggests that performance-critical files should be placed in the root directory. Second, no matter which directory is being CATALOGed, the blocks-free count refers to the entire volume. This means the blocks-used field does not necessarily reflect the sum of the blocks-used for each file displayed.

Finally, here is an example of a benefit. Some program disks now load the correct program to run on either a *II+* or a *IIe*. A ProDOS-based program could access several machine-specific files simply by specifying the appropriate directory in a PREFIX command, leaving the individual filenames untouched.

TEXT FILES

As I said earlier, the only new command is FLUSH. Other changes relate to new or changed use of parameters.

The OPEN command no longer needs the record length of random-access files to be specified. Once a file has been opened with the L parameter, ProDOS remembers the record length and will automatically use it as a default whenever the file is opened. The CLOSE command has not changed.

The READ and WRITE commands have a new F parameter. Files (random and sequential) consist of fields — strings of characters separated by carriage returns. The F parameter tells ProDOS to skip ahead to a given field in a sequential file or random-access record. The POSITION command has also gained the F parameter.

The meaning of the B parameter has changed in a subtle but significant way. Under DOS 3.3 it would set the file position pointer to an absolute position in the file — now it moves the pointer forward to a point relative to the current position.

Finally, the APPEND command now works with random-access file, as ProDOS keeps proper track of the last byte of a file. This also means the file length in the CATALOG command is now accurate to the byte, not to the sector.

ADDED COMMANDS

Apple has provided a mechanism for adding new ProDOS commands under Basic. You store a branch to your routine in the Basic global page and follow some simple conventions in your code. To protect the code from Basic and ProDOS, you can ask ProDOS to allocate space between BASIC.SYSTEM and its file buffers.

MACHINE LANGUAGE INTERFACE

The machine language interface (MLI) is a less visible but extremely important addition to ProDOS. Under DOS 3.3, there were two ways to perform disk commands in machine code. If the DOS command interpreter was present, you could issue a command through COUT. The alternative was to call DOS routines directly, which assumed DOS would not change. So many programs did this that Apple was unable to improve DOS 3.3 while maintaining program compatibility.

Eventually, Apple bit the bullet and wrote an entirely new DOS. It is an enormous change internally, and most machine language programs will need modification. Hopefully this will be the last time it will ever be necessary.

All interfacing to ProDOS is done through a set of vectors in the Global Page, known as the MLI. We no longer care if Apple changes the internals of ProDOS, as long as we can always call the same address in the same way. To discourage people from bypassing MLI, Apple intends to deliberately change ProDOS internals between releases.

A call to the MLI looks like figure 5.

There are 26 ProDOS calls, covering such things as creating, opening, reading, writing and closing files, reading and writing blocks on a volume, allocating interrupt vectors, getting file and volume information and reading the system clock. The parameter lists are different for each type of call, although often the same list can be used for related calls, such as READ and WRITE. The MLI returns 29 error codes in the A register.

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MISCELLANEOUS

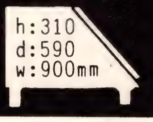
ProDOS is being shipped with new drives, (along with DOS 3.3), and should be generally available by the time you read this article. Apple says DOS 3.3 will be supported for several years yet, although it will probably stop selling it in about a year.

The ProDOS user's disk comes with ProDOS, BASIC.SYSTEM, the Filer, several demonstration programs and Convert, a Muffin-like utility which converts most files between DOS 3.3 and ProDOS and vice-versa. The major exception is random-access files, which require extra work.

ProDOS software already available includes Apple Works, GPLE, and the new Apple *//* mouse program, Mousepaint, which includes a separate Formatter program. This should be able to be BRUN as a format utility from user programs, overcoming the lack of an INIT command.

I would recommend ProDOS. The increased speed and power easily compensate for any minor irritations, and you are unlikely to find an easier conversion to another operating system. The documentation I have seen (mostly pre-release) is up to Apple's usual excellent standard. All these things make ProDOS a Pro-fessional DOS. My final comment is: "Try it, you'll like it!"

Peter Watson is a prominent member of the Melbourne Apple user community.



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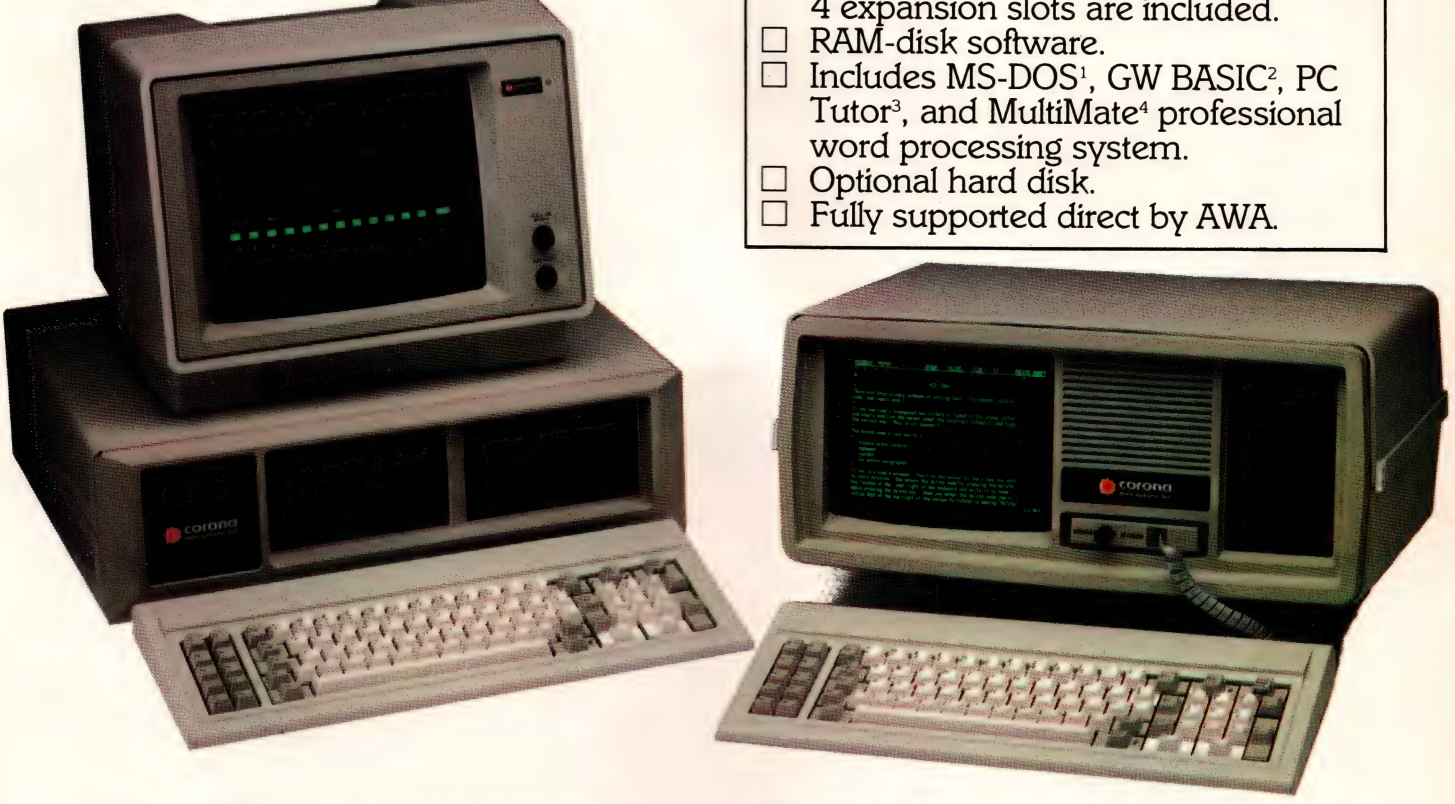

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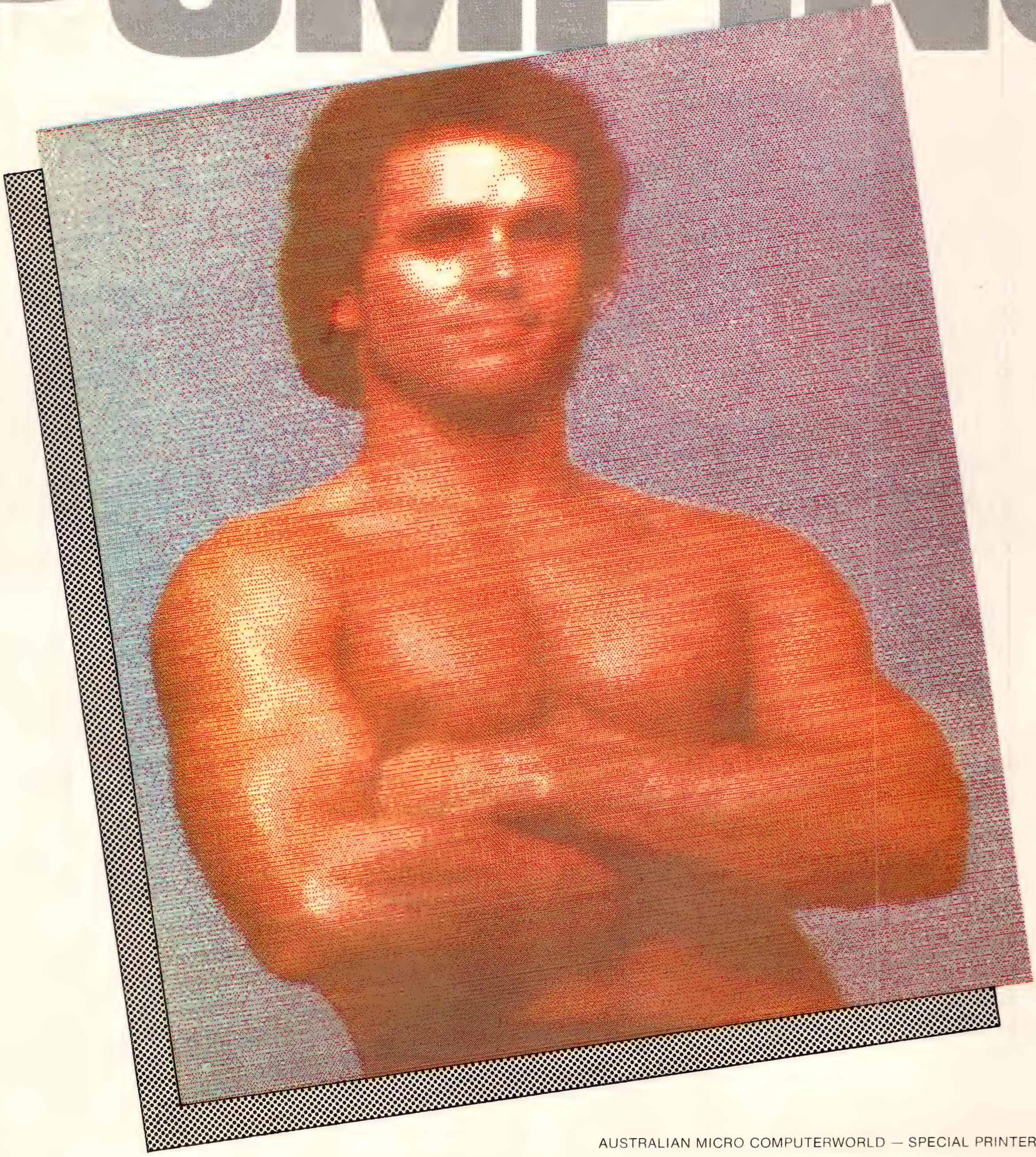
**Ink-jet technology has promised to deliver a cheap, fast, quiet printer for several years.
Slowly, the enormous demand for printers and the interest in color printing is encouraging manufacturers to exploit the possibilities of ink-jet printing. Janette Martin looks at the progress**

PUMPING



INK-JET MAKES A MOVE

PICTURE this. You're on deadline to finish a manuscript as the printer pounds away.

The telephone rings. You push the pause button on the printer and, as the conversation progresses, you start counting the minutes of lost printing time.

When the call is completed, you resume printing, and the rat-a-tat hammering blots everything else from your mind. It's too noisy to read and, even if you had a print buffer, it would still be too noisy to write. You could leave the room, but the possibility of mechanical problems prevents you from leaving the printer unattended. There's nothing to do but wait and suffer.

There are alternatives: buy a $500 silence cover for a $400 printer, wear earplugs and take the telephone off the hook, put the printer in a closet lined with soundproofing material while hoping that the tractor feed never fails — or invest in an ink-jet printer.

Ink-jet printing technology has existed for several decades, but the past few years have shown major improvements in simplicity of design and mechanical reliability. Technological refinements and lowered prices have made ink-jet printers a competitive alternative.

Ink-jet is non-impact printing — no mechanical part of the printhead makes contact with the paper or platen. The difference between impact printing and non-impact ink-jet printing is similar to that between pounding a hammer against a wall and squirting water from a hose on to a wall.

Impact printers include pin-type dot-matrix, daisywheel, and thimble printers. Pin-type printers (also called needle or wire printers) have pins in single or double vertical rows at the tip of the printhead. Tiny hammers selectively hit the pins against the ribbon that is pressed against the paper on impact. The result is a matrix of dots that form characters.

Daisywheel and thimble printers are letter-quality printers that have fully formed characters affixed to the spokes of plastic or metal print wheels. The print wheel or thimble is rotated on the printhead so that the selected character is positioned in front of a hammer. The hammer hits characters one at a time against a ribbon that impresses the image on to paper.

Character printers produce top-quality copy, but at slower speeds and greater cost. Impact dot-matrix printers provide type of lesser quality, but they are faster and are capable of producing simple graphics images such as bars and lines. Most character printers can print only alphanumeric characters.

Non-impact printers for the microcomputer market include thermal, electrosensitive, and ink-jet. The first two require specially coated paper. Thermal printers create type by selectively heating pins of a dot-matrix printhead. The heat darkens the coated paper in dot shapes that form the character matrix. The printhead never touches the paper. Electrosen-

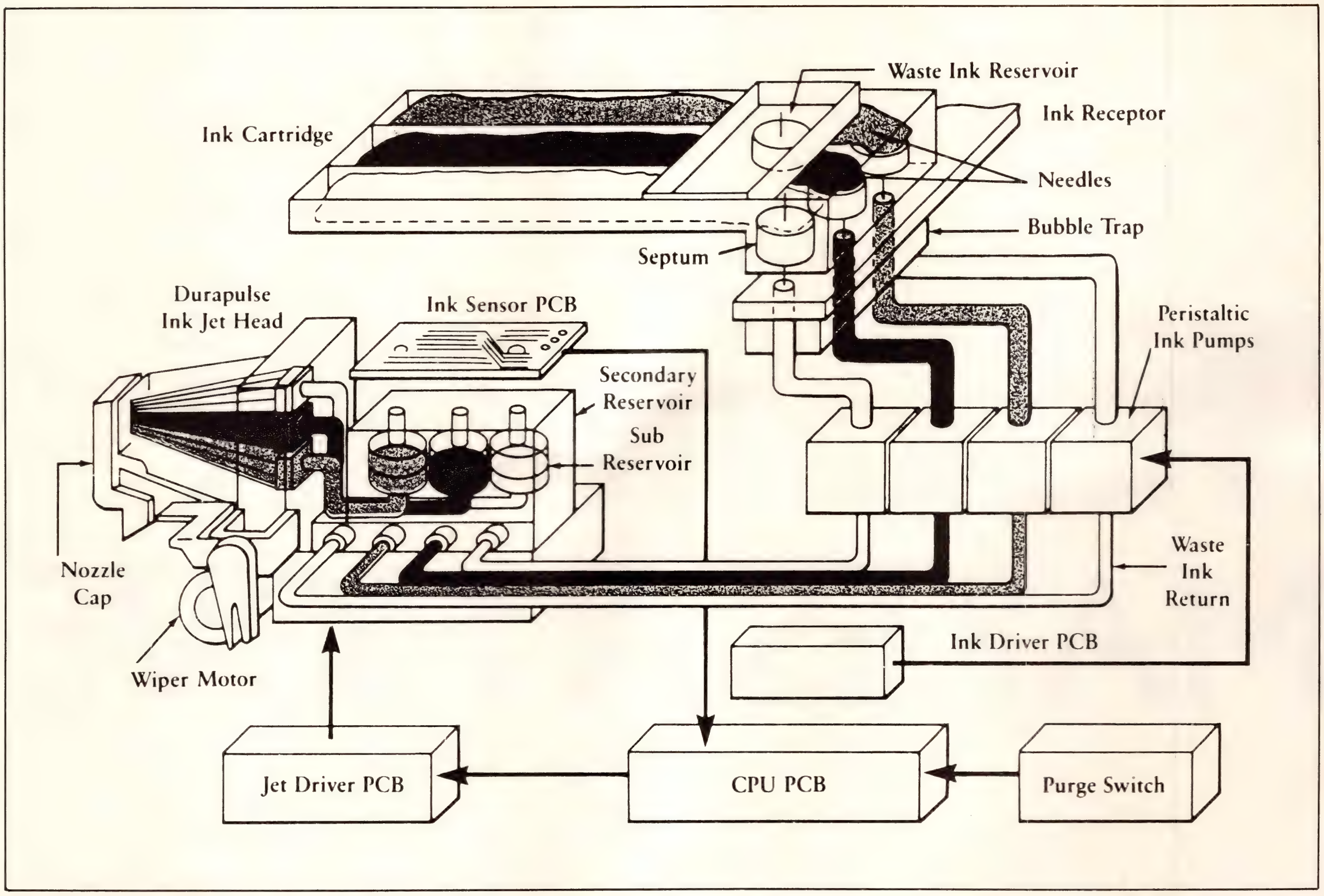


Figure 1: Construction of a color ink-jet mechanism.

sitive printing has a similar printhead configuration, but the head emits electrical charges at selected dot points close to the surface of the paper. The charge removes the paper's coating in dot shapes, and the character matrix is formed.

INK-JET vs. IMPACT

Instead of using pins at the printhead to form the dot matrix, ink-jet printers use ink-filled channels that spray liquid ink drops. There are two major categories of ink-jet printers: drop-on-demand and continuous stream.

Continuous-stream printers use a single ink channel that emits a stream of ink which is broken into separate drops by electrical stimulation and printhead movement. Not all ink from the stream is used. Some ink drops are discarded and recycled. The complexity of the recycling system makes continuous-stream printing very expensive (see Ink-Jet Technology on next page).

In drop-on-demand ink-jet printing, an ink cartridge feeds ink into several channels. When pressure is applied selectively in each channel, drops of ink are ejected and deposited on paper.

Unlike continuous-stream printers, no ink is spilled or wasted; hence, no need for a costly recycling system. High-quality bond paper can be used with ink-jet printers, but special polyester-based paper with good absorbency is recommended for best results.

Ink-jet printers have one obvious disadvantage compared with impact printers — they cannot produce multiple carbon copies. Manufacturers also warn users not to run the printers in dusty environments since particles in the air can become lodged in the ink outlet, thereby clogging the nozzle orifice.

If the printer remains unused for long intervals, the ink at the channel orifice may dry up. But the printers come equipped with self-cleaning methods that allow the ink to be flushed out of the orifice by manual pressure on the ink supply cartridge.

One further caution: if you want to use the printer at altitudes higher than 15,000 feet (Mt Everest, for example), you might have a problem with atmospheric pressure. Tibetan word processors beware.

Ink-jet printers have many advantages, the most notable of which is the noise factor — specifically the noise they do not make. My hard disk makes more noise than the Siemens printer I tested. Productivity is increased when there is less noise pollution, whether the working environment is an office full of people or the electronic cottage.

Another advantage of ink-jet printing is low maintenance. The manufacturers claim that their printers are virtually maintenance-free.

No oil or lubricant is needed for the printer since it has few moving parts in the body and none in the printhead. The Siemens PT 88 printer, for instance, has only two motors: one that moves the carriage from left to right and one that performs the paper linefeed function.

Since the printhead of the ink-jet printer never touches a surface, it is not degraded through use. The life of the printhead is estimated at about 10 billion characters. Compare that to the estimated 200-million-character life of sophisticated impact dot-matrix printheads.

The uniformity of character image produced by ink-jet printers compares favorably with that of impact printers. A worn ribbon produces increasingly lighter images, but an ink-jet image always remains the same.

Ink-jet printers are fast, achieving speeds from 150 to 270 char/sec. By comparison, an IBM dot-matrix printer is rated at 80 char/sec, a DataSouth dot-matrix printer is rated at 180 char/sec — and letter-quality character printers average 12 to 80 char/sec.

COLOR PRINTING

We live in a world of color images. Our television sets, movies, even some newspapers produce vibrant color imagery.

Clearly, there is a trend in microcomputer hardware and software toward color imaging. While most color printing capabilities are still prohibitively expensive for the single user, they are becoming more affordable for environments in which hardware resources are shared.

Color graphics can be used to call attention to detail. Since particular colors on the spectrum dominate, our attention is naturally drawn to the more vibrant, bright colors such as red and, consequently, to the data represented by the dominant color.

For educational purposes, color can help the reader locate separate items quickly (such as answers to questions) or differentiate between

INK-JET TECHNOLOGY

TWO main technologies are used in ink-jet printing. Drop-on-demand ink-jet printing is the type used by Siemens and several other manufacturers because it is simple, efficient, and inexpensive. Continuous-stream ink-jet printing is more complex and expensive, and consequently is not as widely used as drop-on-demand.

Drop-on-demand involves use of an airtight ink cartridge that feeds ink to channels aligned in vertical rows on the printhead. Each channel has an orifice from which drops of ink are selectively extruded and deposited on paper.

A slight negative pressure is maintained inside each channel to keep the ink from inadvertently escaping through the orifice. A concave meniscus (inverted cone) forms at the orifice when extrusion is not in progress and keeps the nozzle orifice clean.

In the Siemens ink-jet print mechanism, peizoelectric crystal tubes in each ink channel are stimulated by an electrical pulse. When stimulated, the crystals expand, causing an increase in pressure inside the channel.

High-frequency stimulation has an oscillating effect on the crystals. Increasing pressure in the channel pushes ink away from the crystal and toward the nozzle orifice where a bulb of ink is formed.

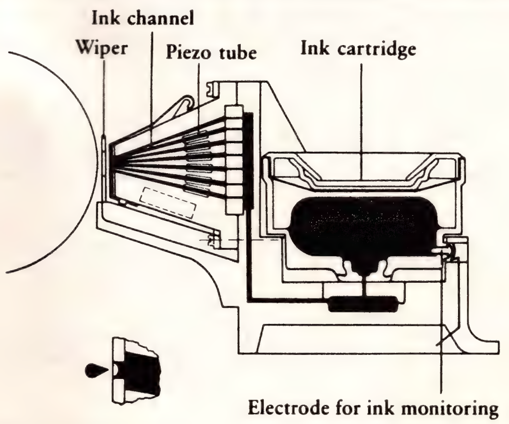
When pressure is decreased from the crystal's contraction during pauses in the application of the electrical pulse, the bulb breaks off, forming a drop that is deposited on the paper. Groups of drops on paper form character and graphic patterns.

Continuous-stream printing is faster than drop-on-demand printing and produces somewhat higher quality print and graphics. This method uses only a single channel on the printhead.

The channel's nozzle emits a constant stream of ink that breaks into separate drops from horizontal printhead movement and the natural instability of the jet. Uniformity of drops is ensured through stimulation of the jet by an electrode.

Drops are selectively charged and passed between two facing, charged deflector plates. Uncharged drops fall into a gutter while charged drops are propelled by the deflector plates on to paper.

The unused ink that drops to the gutter is filtered and recycled. The recycling mechanism involves filtering systems and a circulation pump, making the technology complex and costly. IBM manufacturers a continuous-stream ink-jet printer that costs almost $US30,000.



A Siemens ink-jet mechanism.

screen responses and user input. More information can be conveyed in a smaller amount of space with color graphics because more variations in detail can be achieved with multiple colors than with black and white shades.

Color printing for the microcomputer can be achieved with both impact and nonimpact print techniques. In impact color printing, a dot-matrix printer can be used with a multicolor ribbon (usually three to four colors). The printer applies one color at a time on a line or page and then repeats the process until all colors have been applied.

This is a time-consuming process. Solid areas are often also incompletely filled because the dots do not overlap. Ribbons become worn, so colors become less vibrant with wear. However, impact color printing is fairly inexpensive on a per-copy basis.

Color ink-jet printers use multicolor ink cartridges instead of single-color ink cartridges. The different color inks are fed from the cartridge to the channels in the printhead where colors and color combinations are sprayed on to paper or transparencies (see figure 1).

Prices of color ink-jet printers are falling so that they are now within the range of multi-user operations that share hardware costs.

Color ink-jet printing has several advantages over impact color printing. Filling solid areas is more uniform because the ink droplets can overlap. Different color ink drops can also be sprayed directly on top of each other.

As the ink is translucent, this overlaying produces a great variety of colors out of the three to four primary colors provided. For example, green is produced when cyan and yellow are combined.

Through a process called dithering, different color intensities can be achieved. Dithering means that drops of ink are applied at an increased density with a dot-matrix to create darker shades of color. One dot applied to a two-square matrix will produce a lighter color image than four dots applied to the same area.

Choosing any piece of computer hardware is a difficult task because state-of-the-art is often a fleeting, if powerfully attractive, attribute in the rapidly changing world of microcomputers. We want better, cheaper, faster, smaller, and quieter.

All those characteristics are now available in ink-jet printers. If the ability to make multiple copies is a minor consideration for you while the ability to work near your equipment and think at the same time is major, maybe you should see what ink-jet printing is like today. m

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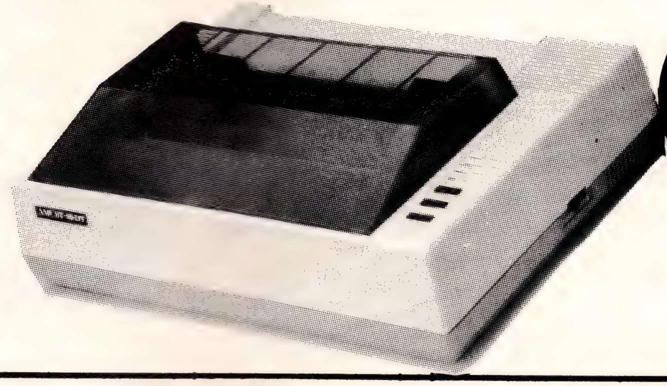

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Compare the Tandy 2000 to the IBM Personal Computer

Price Comparison†	Tandy Model 2000	IBM Personal Computer
Base Unit	**$4450**	$3429
2nd Drive	**Included (720K)**	$821 (320K)
Monochrome Monitor	**$349**	$644
Display/Printer Adapter	**Included**	$516
128K RAM (Total)	**Included**	$251
RS-232	**Included**	$188
MS-DOS 2.0	**Included**	$115
Total Cost*	**$4799**	$5964
Feature Description	**Tandy Model 2000**	**IBM Personal Computer**
Internal Memory	**128K Standard**	64K Standard
Disk Capacity per Drive	**720K**	160K or 320K (Optional)
Microprocessor Clock Speed	**8 MHz**	4.7 MHz
True 16-Bit Microprocessor	**Yes (80186) 16-bit/16-bit data path**	No (8088) 16-bit/8-bit data path
User-Available Expansion Slots*	**4**	2
Graphics Options		
Color Resolution	**640 x 400**	320 x 200
Number of Colors	**8**	4
Monochrome Resolution	**640 x 400**	640 x 200

*Comparable IBM configuration with monochrome adapter and display, communications adapter, two 320K disk drives and 128K RAM. †Manufacturer's pricing as of 1/9/83.

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Enter U030 on Enquiry Card

Ink-jet printers are fast and quiet. Tony Smith describes six printers available in Australia, from Hewlett-Packard's low-cost ThinkJet to the pricey but spectacular PrintaColor

Six INK-JET Options

JAPANESE and West German companies almost have a stranglehold on ink-jet technology. Of the nine ink-jet printers identified by Australian Micro Computerworld on the Australian market, five use the same ink-jet mechanism from Siemens and three are based on two different technologies developed by Canon.

The remaining unit, more than four times more expensive than any of the others, is a highly specialised unit more likely to be used as a plotter.

But the US remains supreme in marketing, so Hewlett-Packard's brilliantly named ThinkJet could elevate such printers from being objects of interest to an important market position. ThinkJet uses thermal ink-jet technology licensed from Canon which the Japanese have not yet put into production themselves.

Siemens claims an installed base of more than 40,000 ink-jets around the world, but with its performance in Continental Europe stronger than the more competitive English-speaking markets, it will probably only be months before HP is the acknowledged leader. With literally hundreds of other printers on the market using well-proven technologies, it has taken something as potentially superior as ink-jet to provide a serious challenge to the limitations of the wire matrix mechanism.

The biggest immediate benefit of ink-jet technology is its quiet operation. The units being used are certainly no noisier than normal conversation. In contrast with the raucous hammering of all types of impact printers, ink-jet units are rated at least 10dB quieter — 10dB representing a factor of 10 in the way noise is measured on the logarithmic decibel scale.

Ink-jet may also prove to be the only reasonably affordable high-performance color printing technology, with color unlikely to be seriously developed for thermal and laser printing technology. A three or four-nozzle ink-jet mechanism is a lot simpler than that required to move multicolor ribbons or plotter pens, the currently available alternative sources of color.

In keeping with the general development of computing equipment, ink-jet printers, especially the vapor-powered ThinkJet, greatly reduce the number of moving parts.

SIEMENS

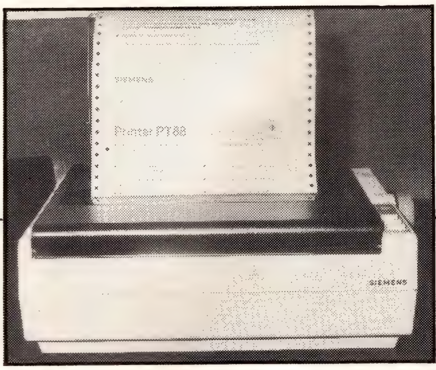
Siemens pioneered ink-jet printing with its PT80 i2 series of 270 char/sec units. This was followed by PT 88 and PT 89, versions of which run as ink-jet at 150 char/sec or as wire-matrix for multiple copies at 80 char/sec.

PT 80 was developed and sold as a serious contender in the general-purpose computer printer market. Character definition was better than standard using a 9 by 12 matrix which can be improved even further by downloading character definitions for a 13 by 12 matrix.

The three variants of PT 80 give a choice between roll paper, fixed width (250mm) or variable width (216 to 400mm) perforated paper.

The availability of an optional pedestal stand and paper supply tray emphasises its up-market positioning. Virtually every feature offered on matrix printers is included, except near-letter quality printing and noise.

PT 88 and 89 offer a more conventional nine-jet head (to correspond logically to the nine-wire version) and make downloadable character sets an option. But the lower 150 char/sec speed allows the tractor feed mechanisms to be more flexibly configured, with PT 88 handling paper widths to 250mm and PT 89 to 400mm.



Siemens offers a long established range of ink-jet printers.

ollowing charact ssible:

i: normal / ed and dc

i: normal / elongated and double st

normal / elongated and double strike

CANON QUADJET

Canon's own one-pass per raster scan (row of dots) seven-color ink-jet printer has been relabelled by option board manufacturer Quadram as the Quadjet. It is configurable for IBM PC and Apple, including its Quadlink board which provides Apple software compatibility for PCs.

Features provided are otherwise just about minimal: a 5 by 7 matrix, no choice of vertical or horizontal spacing save double-width characters, and friction feed paper to 8½in wide. Graphics is provided at either 560 dots/line or 640 for screen dumping, with the print buffer containing either a line of text or graphics eight bits high.

Four ink colors rather than the conventional three are provided, with black not requiring correct register of the primary colors.

Quadram has relabelled Canon's color ink-jet printer as the Quadjet for use with the IBM PC.

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*Apple Users Society of Melbourne

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HEWLETT-PACKARD

While the first generation of ink-jet printers use a peizoelectric effect to physically propel the ink towards the paper, Canon took the technology a step further by developing an ink nozzle in which local evaporation of a tiny amount of ink provides just enough vapor pressure to squirt the required amount of ink at the necessary speed.

In a reversal of the traditional cultural roles of innovator and manufacturer, Hewlett-Packard licensed the technology from Canon and put a very economical and powerful unit on the market. HP's working name for the unit was the rather dramatic Vesuvius. Although maybe Old Faithful might have been a more accurate geophysical analogy, its released title of ThinkJet was certainly an evocative, abbreviated description of the thermal ink-jet technology.

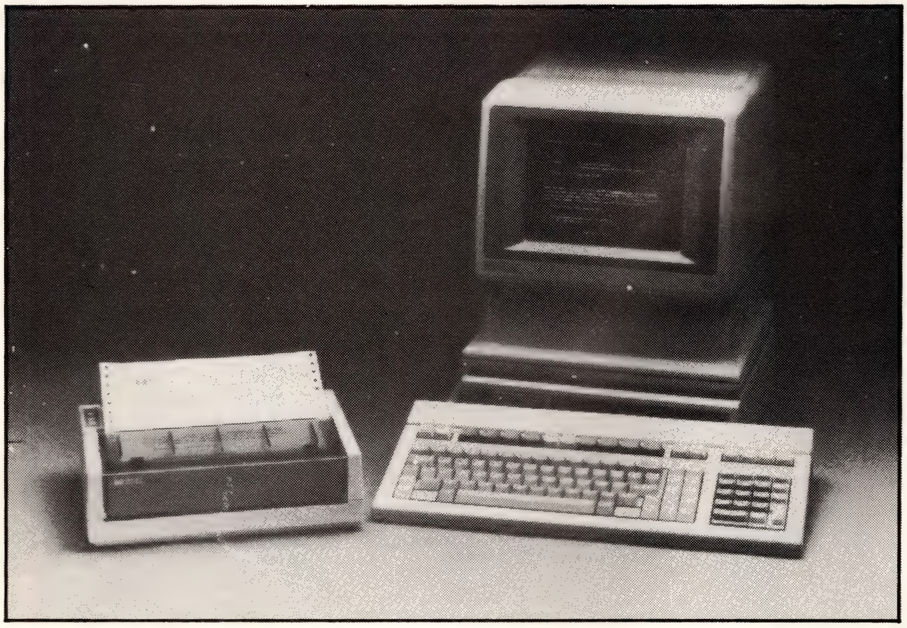
Price reduction of electronic components was never better illustrated than by the fact that ThinkJet's consumable print head contains both the ink bladder and the 12 jets, yet sells for less than 10 per cent more than a Siemens ink cartridge.

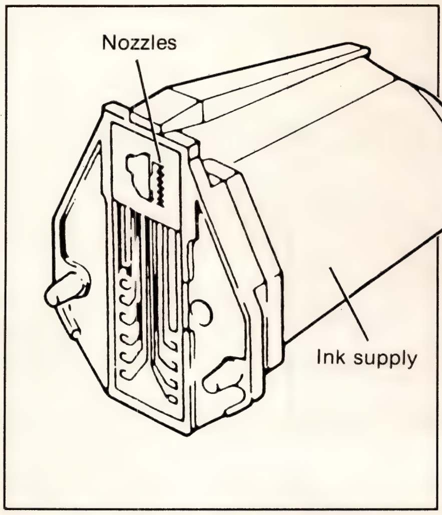
Printing at 150 char/sec with an 11 by 12 matrix provides much better character definition than competitive nine-wire matrix printers and graphics resolution goes up to 192 by 96 dots/in.

ThinkJet's other long-awaited initiative is its portability. The unit is small enough to fit in a briefcase, alongside a packet of A4 paper or HP's portable computer which was recently announced in the US.

While it is originally a black ink printer, provision of color reportedly requires only a new print head from HP's automated Oregon factory built just to make ThinkJet print heads. Color is likely to be available towards the end of the year.

As well as a Centronics interface, ThinkJet is offered with either of HP's two proprietary connections, HP-IB from which the RS422 standard was developed, or battery operated HP-IL. RS232C is not offered.





Hewlett-Packard's ThinkJet printer realises the potential of ink-jet with innovative technology and appropriate pricing.

PRINTACOLOR

The much higher priced PrintaColor GP 1024 provides high-performance color plotting with commensurably variable printing to 60 char/sec, plotting an 8½ by 11in image in less than 90 seconds. It also has 12 nozzles, providing three colored inks to each of four scan lines in a single pass. Seven colors plus white are provided by mechanical binary combination of primary colors, while up to 125 colors are provided under driver software control.

While the nominal graphics density of 120 by 85 points/in is moderate, this is enhanced by a choice of 18 pixel sizes and 18 character sizes on a 12 by 12 matrix.

INK-JET PRINTERS

Manufacturer Model	Hewlett-Packard Thinkjet	Siemens Pt 88	Siemens PT 89	Siemens PT 80i2	Quadram Quadjet	Canon A-1210	PrintaColor GP 1024
Price	$775	$1357	$1477	$2346-$2731	$1710	$1490	$11,244
Ink colors	1	1	1	1	4	4	3
Char/sec	159	150	150	270	40	40	60
Char matrix	11 x 12	9 x9	9 x9	9/13 x 12	5 x 7	5 x 7	12 x 12
Lines per pass	12	9	9	12	1	1	4
Char pitch	multiple	10, 12, 17	10, 12, 17	10, 12, 16.5	18 sizes	18 sizes	12
Graphics	192 dots per in.	Bit image	Bit image	Bit image	65/75 dots per in	65/75 dots per in	120 dots per in
Paper width	8½in	250mm	400mm	216-400mm	8½in	8½in	12in
Paper feed	Tractor/ Friction	Tractor/ Friction	Tractor/ Friction	Tractor/ Friction	Friction	Friction	Friction
Features	Boldface underline	Underline proportional	Underline proportional	Underline proportional	Double width	Double width	18 char sizes
Weight (lbs)	6	17	22	37.5-44	12.3	12.3	37
Noise (dB)	50	45	45	54	50	50	50
Interface (standard)	Centronics HP-IB, HP-IL	—	—	RS232C	Centronics	Centronics	Centronics
Interface (optional)	—	Centronics, RS232C	Centronics, RS232C	Centronics	—	—	Other

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Telephone: (03) 895 2895.

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544 Church St, Richmond 3121
Telephone: (03) 420 7288

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14 Whiteside Rd, Clayton 3168
Telephone: (03) 544 3444

CANON
1 Hall St, Hawthorn East 3123
Telephone: (03) 20 1331

Dot-matrix printers were designed to be a cheap alternative to high-speed band and drum printers, and various models migrated down the price path to microcomputers. Neville Angove, Ian Robinson and Tony Smith look at 108 dot-matrix printers available in Australia.

Which Printer?

DOT-matrix printers have been on the computer scene since at least the early '70s — the first one I met was a DecWriter send/receive terminal in 1975, attached to a PDP-10. But it was not until Epson launched the TX-80 series in 1978 that they became priced low enough for the growing band of microcomputer (and office automation) devotees to use.

Of course, today's market penetration by dot-matrix printers is due mainly to the microcomputer boom of the '80s, but the concept had to be introduced first.

In spite of manufacturers' claims to the contrary, all dot-matrix printers function in basically the same way: characters composed of a column-by-row matrix of dots are printed one column of dots at a time, with each character separated from its neighbor by one or more columns of unprinted dot positions.

Dot-matrix printheads are usually constructed as a set of nine wires or pins positioned vertically. These nine pins must print all possible dot positions in one pass of the printhead across the paper — the full height of upper-case characters, plus the descenders of lower-case characters, plus a row of dots for underlining — and the height of most characters when spread over nine dot positions means very poor vertical resolution.

Horizontal character resolution is determined by the number of dot columns printed per character. The more columns, the better the resolution, but with the increased resolution traded off against printing speed.

MULTI-MODE PRINTING

Draft printing can survive character resolution of (say) nine dots high by seven dots wide. For near letter-quality characters, horizontal resolution can be increased by increasing the number of dot columns (and decreasing the printing speed), while increased vertical resolution depends on overprinting the gaps between dots by advancing the paper minutely after the first printing pass and then reprinting the character.

Effectively, near letter-quality printing means doubling both the horizontal and vertical dot resolution, which for a nine-pin printhead means quartering the printing speed.

Manufacturers intent on providing a faster near letter-quality mode install a second (and sometimes a third) column of pins on the printhead.

Proportional printing is not really near letter-quality printing. Most low-end printers cannot provide proportional near letter-quality printing since proportional characters are effectively a different font and require more complex printer logic — at a higher price.

MULTI-FONT PRINTING

Thanks to the influence of Epson, most middle-level dot-matrix printers provide several sizes of the same font: 10-pitch, 12-pitch, elongated and condensed, superscript and subscript. These printers may also have an italic font, but true multi-font printers provide radically different fonts such as Gothic, Prestige, OCR or Orator. They may also provide proportional printing versions of these fonts or the capability of accepting downloaded fonts (proportional or otherwise).

The highest quality dot-matrix printing occurs when proportional spacing is combined with high dot resolution. The better quality dot-matrix printers combine such printing with high-resolution graphics and multiple character fonts.

The technology needed to give users letter-quality printing at high printing speeds is expensive, because it is pushing electro-mechanical design to its limits. To cut costs, and therefore prices, trade-offs have to be made and research/development costs amortised over larger sales volumes.

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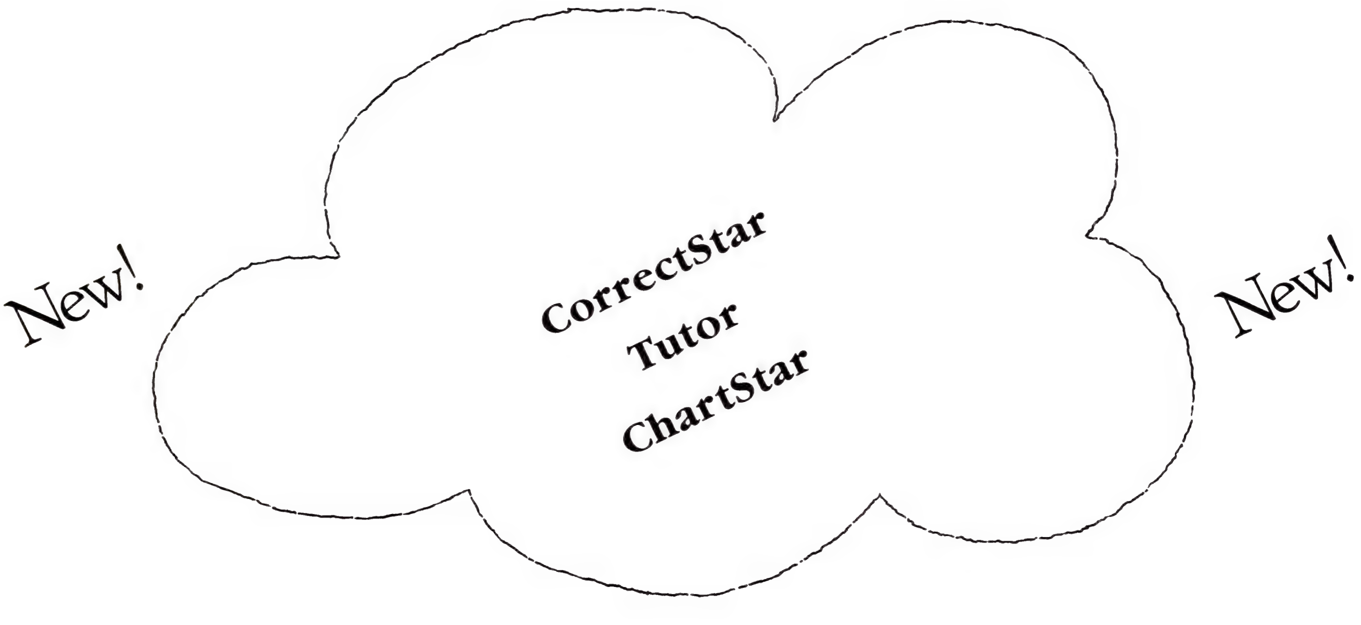

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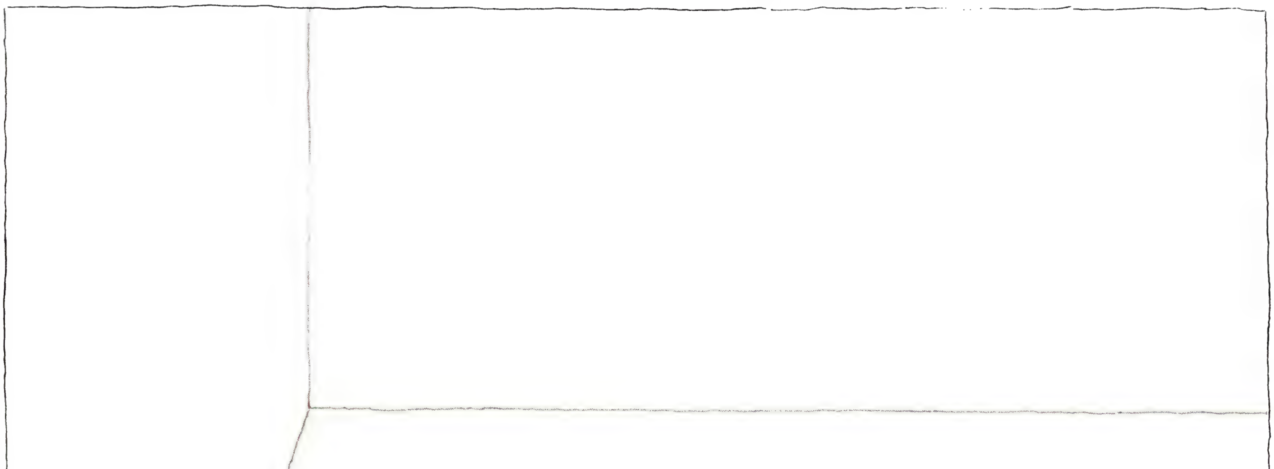

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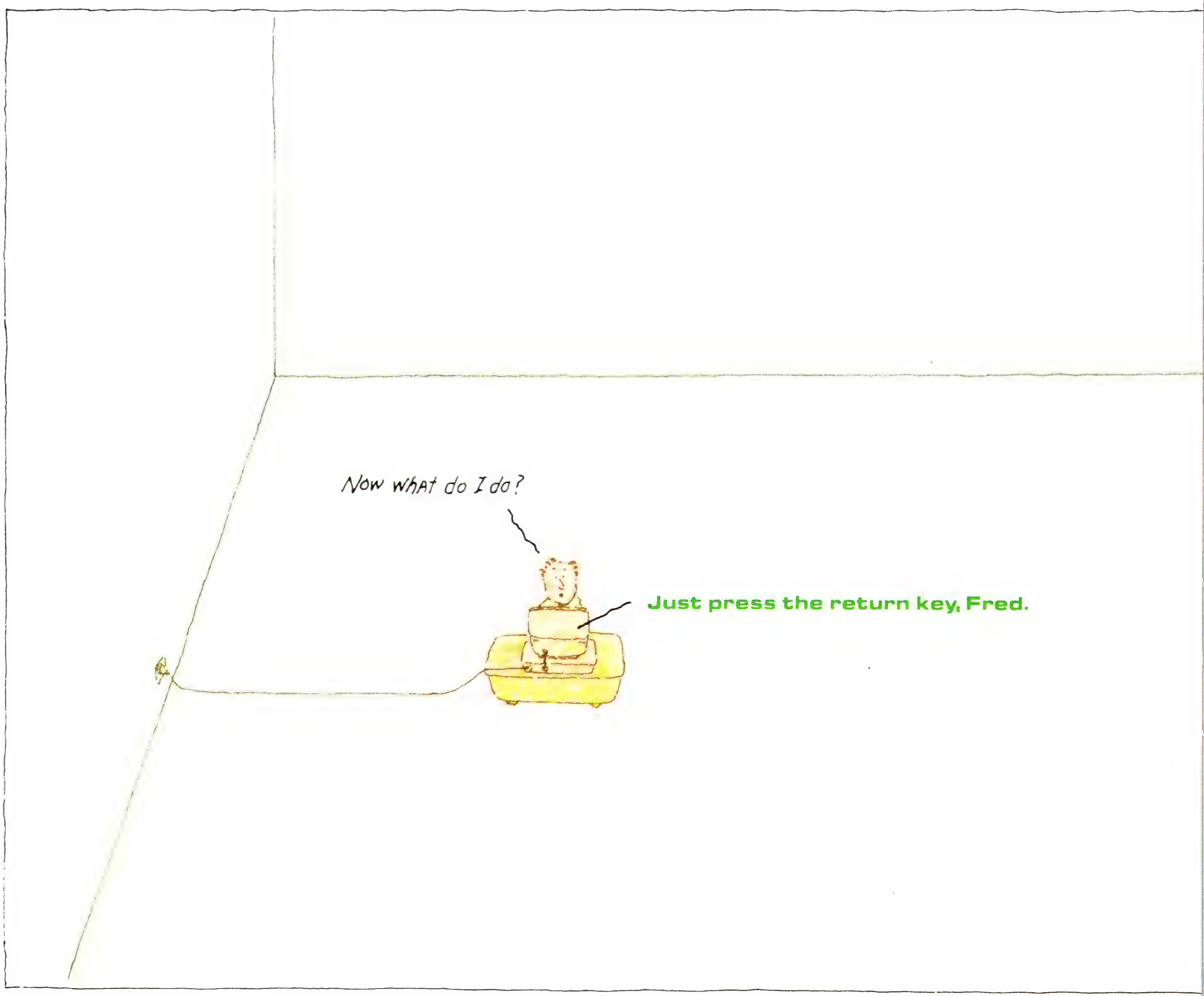
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Amicron Business System	Alex Lopez	Suite 6/281 Pacific Hwy. North Syd	922 3621
Si Microcomputer System	Barbara Bird	5th Fl/23 Berry St. North Sydney	922 3977
A E D Computers P/L	Peter Henderson	Prospect Ind. Centre/2 Stoddard Rd. P'spect	636 7677
The Computer Shop	Hinka Haisma	74 Parramatta Rd. Annandale	517 2999
City Personal Computers	Peter Hatcher	55 York St. Sydney	922 3600
Computer CBM Systems	Graeme Nutt	Suite 5/238 President Ave. Caringbah	525 5022
Direct Computer Sales	Rob Smythe	198 Forest Rd. Hurstville	570 8344
Daro Office Systems	Dan McLeod	60-64 Shepphard St. Chippendale	699 3877
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Computerland South Melbourne	Carl Topp	Suite 19, 37 Albert Rd. Sth. Melb	266 8649
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Labtam	Andy Bugel	43 Malcolm Road Braeside	587 1444
Metropolitan Business Machines	Don Sparks	338-342 Sydney Rd Coburg	383 2222
Microprocessor Applications	Guy Goodman	48 Rutland Road Box Hill	890 0277
Myer Business Centre	Shanti Kumar	295 Lonsdale St. Melbourne	661 3189
National Business Systems	Mike Swinbourne	34-40 Clayton Road Nth Clayton	541 8841
Parity Computer Services	Trevor Dent	424 St. Kilda Road, Melbourne	267 6844
Random Access	Mark Thompson	555 Collins St. Melbourne	62 1339
Select Micro Systems P/L	Gary Briscoe	Fawkner Towers/431 St Kilda Rd. Melb	267 1255
SOUTH AUSTRALIA			
Computerland Adelaide	Dennis Singh	122 Gouger Street, Adelaide	212 7191
Oriental Micro Pty Ltd	Mike Greer	Shop 3/2 Clark Terrace Seaton SA	458 777
The Personal Computer Centre	Gary Briscoe	142 Gawler Place Adelaide	223 2688
Myer Computer & Business Centre	Norman Vincent	36-38 Rundle Mall, Adelaide	
QUEENSLAND			
Arcom Pacific	Margaret Hopkins	252 Abbotsford Rd. Mayne Qld	52 9700
Computerland Brisbane	Paul Rees	1 Adelaide Street, Brisbane	221 9777
Computerland Gold Coast	John Hatch	126 Scarborough Street, Southport	32 8300
Computerland Maroochydore	John Pruin	18 Horton Parade, Maroochydore	43 1677
Shannon Robertson Systems	Sue Frain	4 Carroll Street Nambour	41 3444
Eracom	Bill Cailly	6/26 Greg Chappel Drive Burleigh Heads	56 0911
Myer Computer & Business Centre	Ian Christofis	318-332 Moggill Street, Indooroopilly	253 4567
WESTERN AUSTRALIA			
Computer Choice	Peter Howell	1121 Hay Street West Perth	322 6637
Computerland Perth	Stewart Morrison	SGIO Atrium, 170 St. George Terrace, Perth	322 7188
Micro Base	Mike Goldman	422 Newcastle Street, Perth	328 9289
Myer Computer & Business Centre	Kim Howe	246 Murray Street Perth	321 0151
Stott & Hoare	Peter Livingstone	982 Wellington St. West Perth	322 4456
ACT			
Computerland Belconnen	Ed Gentry	71 Oatley Crescent, Belconnen	82 2342
Eracom	Bob Campbell	57 Colbe Street, Phillip	82 3074
Boulevarde Business Systems	Peter Brown	219 London Circuit, Canberra	48 5411

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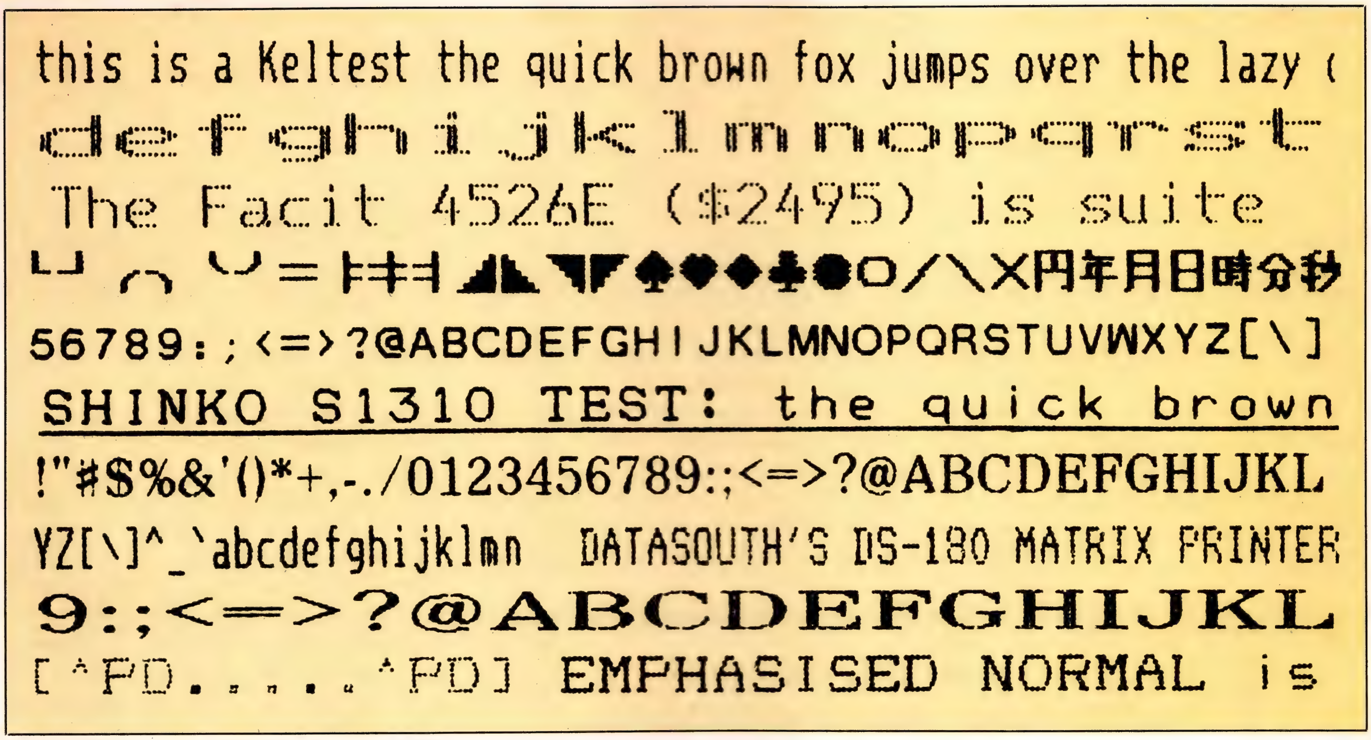

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and the better the quality of design and workmanship of the printer, the higher the price. Because not all users (or all applications) require the same features or the same degree of robustness, the printer market is swamped with machines offering various combinations of features, printing speeds, and robustness.

THE MARKET

The market for dot-matrix printers is on the boil; every distributor claims to be able to sell more printers than can be brought into the country; with estimates of potential sales this year of 50,000 units, the entrepreneurial urge is running hot in otherwise staid microcomputer suppliers.

The dot-matrix printer market is chaotic, due to incompatible conceptions of the market structure for dot-matrix printers by manufacturers and distributors, rapidly changing technology, a re-evaluation of distribution policies by major manufacturers, and changing user perceptions of required printer features.

A reliable analysis of the dot-matrix printer market is nearly impossible because of the unusual nature of the Japanese microelectronic manufacturing industry, where the brand name of a printer may not be indicative of its origins. More confusing still, several Japanese manufacturers are in effect competing with themselves by licensing their products for manufacture under several different names.

The dot-matrix printer market has four levels. The lowest level comprises users who want quality printing but are willing to make concessions for the lowest possible price. The second level sees itself as more upmarket, and is willing to pay for what is supposedly better quality and reliability. The third level, while still wanting the speed and low price of dot-matrix printing, has the urge to occasionally hide the plebian nature of its printers by using letter-quality printing modes and type fonts. The last level wants throughput, either letter-quality or otherwise, and is willing to pay premium prices for speed.

The bottom of the market is catered for by the cheapest printers such as the Amust-DT80, the BMC BX-80 and the CTI CP-80, all Epson clones manufactured by Shinwa for these OEMs (and a number of resellers) to the same basic design but with the odd minor change in logic.

At less than $400 retail, these printers provide the same printing speed and quality, reliability and ease of use as did printers at five times the price a few years ago, and cater for the user who might once have been satisfied with a thermal printer or a recycled TTY. The price of these will continue to fall under the onslaught of slightly upmarket models based on the Copal SC-1000 and its replacement, the SC-1200, which are basically C Itoh clones.

What distinguishes these printers in the marketplace is that they are not distributed by the manufacturer. The marketing thrust is by the distributors who treat these printers as another form of consumer electronics item to be shoved out the door until the market is saturated.

The second market level, characterised by small to medium businesses and professionals, is growing rapidly; this group is becoming aware of the need for microcomputers at the same time that the compromise between microcomputer price and performance has reached a cost-effective accommodation.

The manufacturers and distributors are aware that the purchase of one entry-level printer from their ranges — an 80-column model with few if any options — will shortly lead to the purchase of more advanced models at significantly higher prices. This is why the base unit in each printer range has a price disproportionately low in comparison to the next in line — adding another 50 columns width to a printer should be a minor cost increase, but instead generally increases the price of the printer to the user by nearly half.

The fact that these printers have wide-carriage versions indicates that they are destined for the second-level market where there is a need for dot-matrix printers to accept 15in paper, partly as a holdover from mainframe DP practice, but mainly because it removes a hardware-dependent restriction and allows flexibility in software selection and use.

The major marketing thrust is at this second level because it is both more affluent (and willing to accept a higher price for better quality — or unable to make a valid judgment about the quality except on the basis of price), and is potentially the largest market for single unit sales of more expensive printers. The bottom line is a higher profit and better market penetration.

This second market also includes the possibility of multiple-unit sales to corporations. A company which bulk-buys 500 IBM PCs is also likely to buy 100 printers, and a high profile in the marketplace will attract the appropriate attention.

The higher grade dot-matrix printers from Star, C.Itoh, Oki and Epson (for light duty-cycle applications), and the Anadex, DataSouth, Genicom and NDK (for heavy duty-cycle applications), are pushing old technology to its limits to produce printers with more features, higher throughput and better reliability. These manufacturers see a market that is quickly becoming more sophisticated and more strident in its demands for a better product at a lower price.

Because of the obvious profitability of this second-level market, companies not usually associated with a computer manufacturer, but with considerable expertise in the design and manufacture of microelectronics, such as Logitec, Shinko, Teco and Kanematsu, are supplying their own variants of a middle-level dot-matrix printer.

A factor which interrupted the orderly evolution of printers for this market was the selection by IBM of a variation of the Epson MX printer as the "standard" for the IBM PC. This move dramatically increased Epson's market share directly, created a new market for Epson printer components and Epson-compatible printers, and destroyed any incentive to refine dot-matrix printer technology for use with personal computers.

This move dramatically increased Epson's market share and destroyed any incentive to refine dot-matrix printer technology for use with personal computers.

Manufacturers aiming at this market are now facing competition from below and above. Printers with similar features but selling at much lower prices are now available, while the price of multi-mode and multi-font dot-matrix printers such as the Nec Pinwriter and the TI 855 have already dropped enough to undermine the more expensive models.

A third dot-matrix printer market level is again mainly the small-to-medium business and the professional users, but here the perceived need is to upgrade to a yet higher quality product: the dot-matrix printer that can double as a letter-quality printer. This market is about as vaguely-structured as is possible while still retaining enough identity to be perceived as a distinct market.

This market is restricted to users who need to produce higher-quality printing at frequent intervals for dissemination to people who will only accept higher-quality printing: professional offices, executive-level secretaries in private business, and government offices. At the same time this market does not see a requirement for letter-quality reproduction that could be obtained on a daisywheel printer.

Of the new printer designs, some have multi-pass printing using the cheaper single-bank nine-wire print head, while others such as Nec have opted for single or multi-pass printing using the more expensive multi-bank print heads. Some manufacturers provide several type fonts pre-installed, while others have opted for user-installable fonts.

The features offered by these printers are now being offered by ink-jet printers, although still at a higher price. The scramble for a market share in competition against this still newer technology is likely to result in the same "no brand name" approach found at the lowest level of the dot-matrix printer market.

The highest market level is occupied by those printers capable of very high throughputs. Although many have been sold for use as the central printer of a microcomputer network, no manufacturer or distributor seems certain of the future of this market, but most agree that the era of the cheap ink-jet printer or laser printer will destroy any demand for the very expensive high-throughput dot-matrix printers.

DOTS TOMORROW

What may allow the dot-matrix printer to survive is the large user base and the wealth of technical expertise that has built up over the past decade, coupled with a Luddite fear of new technology. Today's dot-matrix printers can do almost anything we ask of them, without forcing the user to amortise the expense of the development needed to bring the new technologies to the same level of utility.

There is still room for adding to the features of dot-matrix printers while still lowering their price. While the market share of these pinheaded appliances may decline, the growth of the overall printer market will see them survive for at least a few more years.

THE BEST OF THE BUNCH

CHOOSING a printer is not easy — unless price is the only consideration. You need to decide in advance what features your printer must have, what features would be good to have, what type of duty cycle the printer will face, and what type of support you will need from your dealer.

After reducing the list of contenders to something reasonable, you need to evaluate the quality of the printer, its documentation and its price. Whatever printer package meets your needs — current and projected — at the lowest price is the one to buy.

LESS THAN 120 CHAR/SEC

At the lowest market level, where all you need is readable print at speeds of less than 120 char/sec, there is not much choice since the printers are virtually identical and there is no distinction between light and heavy duty cycles. It is a matter of looking for the best price and support.

If you want a **color** printer, the **CTI CP-1018** is about the only offering for this market.

LESS THAN 200 CHAR/SEC

At the second market level, where draft printing speeds range from 120 char/sec to 200 char/sec, and a near letter-quality mode of some kind is preferred but not mandatory, there are scores of printers designed for light duty cycles. Any of the **Epson FX** clones (even an orginal Epson FX) will satisfy your needs, and I know that the **Star Delta** can survive a lot of punishment without faltering, but the range of **Logitec** models should not be dismissed without careful evaluation.

My personal choice would have been the **C.Itoh 1550BPI**, if it were not for the unreliable paper feed through the tractors; it is fast, reliable and easy to use, and offer the IBM PC printer emulation. Failing that, the **C.Itoh 1550S** or the **Genicom 3014/3024** offer good value for money, for the time being anyway. The Genicom models may be the best value due to their flexibility and speed.

If you need color, the **C.Itoh 155OSC** is the best value, offering all the features of the C.Itoh 1550S as well as color. The **Genicom 3184** can be configured for color printing as an extra if you do not mind paying almost twice the price of the C.Itoh for features not required for this market level.

For heavy duty cycle applications, the bottom end of the **Anadex** range **(DP-9000/9001, DP-9500/9501)** should be considered, if you do not mind the lack of single sheet feeding. The **Microline 93** and **84** also stand out; although not designed for a heavy duty cycle, in practice they perform reliably in this role. Finally, the two **DataSouth** printers should not be left unconsidered.

For **color** printing and **heavy duty** cycle, the **Genicom 3184** with color option seems suitable, although it is still over-featured for this market. The same can be said for the **Anadex DP-9725B.**

NEAR LETTER QUALITY

The third market level, where a draft printing speed of 120-200 char/sec is still required but some form of letter-quality printing is now mandatory, is served by a confusing array of offerings. For light duty cycle applications, my choice is the **Nec P2/P3 Pinwriter** because of its ease of use, variety of printing modes, range of supporting options and very low price. It just edges out the **TI 855** (which would have been may choice if the Pinwriter did not exist).

For **heavier duty** cycle applications, the **Genicom 3024, 3184** and **3304** seem to be good multi-mode and multi-purpose printers. The fact that they can print proportionally in every character mode makes them stand out from the crowd. The best featured multimode and multifont printer suitable for this market seems to be the **NDK S7700.**

If you want **color** printing, the **Anadex DP-9725B** offers multimode and multi-color printing, and the **Genicom 3184** and **3304** can be configured for color at extra cost.

VERY FAST PRINTERS

For the high-speed printer market, the choice is more limited. The prices asked put most models out of the reach of microcomputer users. For light duty cycles the **Genicom 3404** and **Anadex DP6500** offer high speed and high quality in multimode printing at a reasonable price, and the **Centronics 358** is a possibility, while the **Trilog TIP-300** has a design that will withstand a heavy duty cycle.

For **color** printing, the **Anadex DP-9725B** is a good low-speed (relatively) printer, and the **Genicom 3404** with the color printing option offer higher speeds. Matching the **Genicom 3404** for speed (but at a higher price) is the **Centronics 358.** There seems to be a big gap to the top end, where the **Trilog TIP-302** sits.

In all speed and quality ranges, printers designed to interface with the manufacture's own computer models can be treated similarly to any other printer. Most are based on large-selling models such as the **Amust-80DT,** but use proprietary interfacing techniques: you can attach a Commodore printer to a Commodore computer, but to no other computer (except the relevant clone).

If you think you are restricted to buying a printer of the same brand as your computer, take heart. Several companies manufacture and/or sell suitable interfaces.

ALPS ASP-3500

One printer that does not appear in the public eye too often is the Alps ASP-3500. For $2000, it offers a 181-element character set, 180 char/sec speed, switch-selectable 6 or 8 lines/in spacing, 10, 12 and 16.5 char/in character size (plus elongated versions of each size), cartridge ribbon, tractor feed, and a heavy-duty cycle.

Although considered a lightweight, the ASP-3500 is hefty compared with many microcomputer printers, being 62cm wide, 20cm high, 41cm deep and weighing 19kg. The ASP-3500 is well thought of by computer professionals, and although it does not seem to offer any advantages over cheaper lightweights, it bears closer examination.

Mitsui Computer Systems,
1-3 Rodborough Rd,
Frenchs Forest, NSW 2086.
Tel: (02) 451 7711.

AMUST-80DT

The fastest-selling dot-matrix printer for personal computers is the Amust-80DT and its various clones. The reason for its popularity is that it emulates the low-end Epson printers but sells for less than $400.

The Amust-80DT prints at 80 char/sec, accepts paper up to 10in wide, has built-in tractor and friction feed, high-resolution graphics, four print modes (pica, pica enlarged, condensed, condensed enlarged), and a serial or parallel interface (other interfaces for the IBM PC, Apple *II*, TI 99A and Commodore are available).

Basically, the Amust-80DT is the printer that cost more than $1000 only a year ago. If you do not like the name, you can also get it as the BMC BX-80, Mannesmann-Tally Spirit, Microbee MB-80, TRS-80 DMP-100, CP-80, or in a variety of other liveries.

Micro-Educational Pty Ltd,
17 Park Road,
Garden Suburb, NSW 2288.
Tel: (049) 43 0624.

ANADEX

Anadex Inc is another Californian peripheral manufacturer specialising in heavy-duty dot-matrix printers.

All printers in the Anadex range are ruggedly built, which is a polite way of saying that they are incredibly heavy (15-25kg), and definitely non-portable. Nevertheless, for any fixed applications requiring fast, reliable throughput, the Anadex range should be considered.

The heavy cases found on all models could in fact be regarded as a feature, as they provide stability at high-speed operation. The cases also help to reduce printing noise to an acceptable level (less than 55 dBA at 1m).

The Anadex range starts with the Silent/Scribe models, namely the DP-9500B (8in) and DP-9500B (13in), followed by the multi-mode DP9620B, the Color/Scribe DP-9725B the Word/Scribe WP-6000, and Rapid/Scribe DP-6500.

The base model of each is a parallel-interface, tractor-feed device, with serial interface and sheet-feed as optional extras, along with additional character fonts, including APL characters.

Expanded characters, variable pitch and line spacing are all supported, along with programmable dot graphics and a 3.5K-byte buffer. The newer B-version models have interface-specific DIP switches located next to the interface plugs and all other DIP switches on the front panel. (The older version DIP switches are less accessible).

The multi-mode version of the Silent/Scribe offers enhanced, condensed, dual-pass, and proportional printing modes, at speeds varying from 60 to 240 char/sec, depending on quality required. Printed output can also be justified to the left, right, both sides, or centred. Further font options include optical character recognition and UPC/Code 39 bar codes. (ROM options are $143 each).

The Color/Scribe is Anadex's latest offering and features full compatibility with the IBM PC. Either a four-color or plain black ribbon may be fitted, depending on the task. The color mode allows 16 different colors, presumably those available on the PC.

All multi-mode printer features are supported, as the Color/Scribe is an upward-compatible version. But changing the ribbon can be a tricky operation.

Further up the Anadex range is the Word/Scribe, a letter-quality printer with a wide variety of typefaces, including Helvetica, Serif, Scientific, and user downloaded characters. Speeds range from 125 to 275 char/sec. All previously described options are available.

The top of the range is the high-

The Anadex Color/Scribe is IBM PC compatible.

velocity Rapid/Scribe, which belts along at more than 500 char/sec in high-speed draft mode. This translates to about 275 lines/min, a throughput that nearly shakes it off the table.

An outstanding feature of all Anadex printers is the comprehensive documentation. The product manuals are thick, well-bound, contain many example programs, diagrams and photographs.

Datascape International Pty Ltd,
44 Avenue Rd,
Mosman, NSW 2088.
Tel: (02) 969 2699.

BMC BX-80

This is the same as the Amust-80DT, although the specification sheet claims it has only half the horizontal resolution of the Amust-DT80 and sells for around the same price.

Eastern Micro Electronics Ltd,
92-94 Bank Street,
South Melbourne, Vic 3205.
Tel: (03) 699 3088.

CANON A-1200/1250

The Canon A-1250 (the A-1200 is a smaller version) is a high-quality graphics printer, printing at 140 char/sec in draft mode and 24 char/sec in near letter-quality mode. It accepts paper up to 17in wide, has a parallel interface only, friction and tractor feed, high-resolution graphics, and five type modes.

As befitting a company that also produces typewriters, the A-1250 can be optioned with different typefaces such as italic. At $1295, the A-1250 is good value now, although it will not survive the onslaught of cheaper printers.

Canon Australia Pty Ltd,
1 Hall Street,
Hawthorn East, Vic 3123.
Tel: (03) 20 1331.

CENTRONICS

Just as IBM created a de facto standard with the PC, Centronics Data Computer Corp, of the US, one of the original printer manufacturers (formed in 1968), has set a standard for dot-matrix printers. However, with the introduction of its latest model, the Horizon H80 — another IBM Graphics Printer clone — Centronics ironically appear to have become a standard follower.

Although the Horizon is not the first Centronics printer designed for the lower end of the market (less than $1000), most of the Centronics range remains firmly centred in the heavy-duty, high end of the market. The Horizon and Centronics 350 Series, namely the 351, 353, 357 and 358 printers, cater to personal computers.

The Horizon H80 and wide-carriage H136 have all the features of the standard Epson-based IBM Graphics Printer but have the added advantages of friction/tractor feed and a half-speed (quiet) mode.

The Centronics 350 Series are all wide-carriage bi-directional printers with cartridge ribbons, replacable printheads, pin-addressable graphics superscript/subscript, friction/tractor feed, and parallel and serial interface as standard. One particular item made conspicuous by its absence is a platen winding knob, because the paper is forward or reverse fed from the printer control panel, by single line or single dot increments. While similar to the Anadex range in dimensions and speed, the 350 Series printers are noticably noisier (about 63 dBA).

The base model 351 has selectable character sets, a 2K-byte input buffer, 16 serial baud rates (50 to 19,200 baud), multipass correspondence-quality mode, and a fast 8in/sec vertical slew rate. The 353 is simply an enhanced version of this, with a 4K-byte buffer, a front panel LCD display, a faster correspondence-quality mode, downline loadable character set, and a convenient tear bar.

The 357 and 358 models are basically faster (400 char/sec) versions of the 351 and 353 printers, with 18-pin printheads and larger ribbon cartridges. The 358 also has the option of a four-color ribbon.

Centronics user manuals have many bold headings and every feature described in detail.

STC Pty Ltd
80 Mount St,
Nth Sydney, NSW 2060.
Tel: (02) 438 4977.

C.ITOH

C. Itoh, represented in Australia by Warburton-Franki, manufactures two ranges of printers. The low-speed range, specifically targeted at microcomputers, includes daisywheel as well as dot-matrix printers. The high-speed range is targeted at minicomputer and mainframe users.

The C.Itoh printers designed for use with microcomputers fall into two categories: the 8510, which will handle paper up to 10in wide, and the 1550, which will accept paper up to 15in wide. There are no other differences between the two.

The first model in the current C. Itoh range is the A model. Designed to compete against the Epson MX series, the 8510A/1500A offered so many word processing features, such as proportional printing, that it was named the Pro/Writer.

Although the 8510A and 1550A have been replaced by the B models, the 8510A is still available from Barson Computers.

The C.Itoh 8510B and 1550B printers are only slightly different from the A models. The case and mechanism are the same, as are the controls. Print speed is still 120 char/sec, printing characteristics are the same, and graphics resolution is unchanged at 144 by 160 dots/in. The only notable difference, apart from the bugs being removed, is that the buffer has been increased to 2K-bytes.

The 8510B and 1550B are solidly constructed printers, with a heavy-duty print mechanism housed in a light plastic case. There are only three controls (select, linefeed and formfeed) and three indicator lights. Tractor and friction feeds are built in, with the push tractor before the print line.

Two banks of DIP switches controlling printer setup are inside the case, reached through a hole in the base plate. Most of these functions are also software-selectable. In the serial model (another $80), four banks of 26 switches are on the serial interface board.

For an extra $100 on the parallel price, you can buy a switch-selectable IBM-PC compatible version (the BPI), which emulates the IBM PC printer even better than the Epson FX, including the replacement of the C.Itoh's bit-image graphics with the IBM printer's graphics resolution. The only escape codes not implemented are the paper-out signal enable and disable.

In spite of having a print speed rated at only 120 char/sec, the fast paper slew rate gives an effective throughput of about 100 char/sec, which puts the 8510B and 1550B well ahead of the opposition.

The 8510B and 1550B are simple to use, with a lot of thought obviously taken in their design. The documentation is clearly written and illustrated. The only problem I found was with the tractor feed, where the grip on the paper was not positive enough to stop the occasional paper jam.

The 8510B and 1550B, at $950 and $1300 respectively for the parallel versions without cables, are now priced below the equivalent Epson models.

The B models are in the process of being replaced by the S models, whose features compare more favorably with the Epson FX. The 8510S and 1550S differ from the B series in having a redesigned case with a repositioned control panel (although the first S models marketed still have the B model case), and a tractor mechanism that cures the problem of insecure paper feed.

The S models have other differences to warrant an increase in price of nearly $200. First is a high-speed draft printing mode of 180 char/sec. They also have an italic character set similar to the BPI models, although there is not yet a variant of the S model that emulates the IBM PC printer. Another change is the addition of true superscripts and subscripts instead of the half-line feeds that were virtually impossible to implement.

Another C.Itoh printer model is the SC which is the same as the S except that, for an extra $150, it offers seven-color printing (from a three-color ribbon) that is as good as found on any color printer.

Two other C. Itoh printers should be of interest to microcomputer users wanting still higher throughput. The CI-300 and CI-600 models, although marketed as line printers, use a 9-pin dot-matrix shuttle print head that still passes across the carriage but at speeds of up to 600 char/sec in draft mode and 150 char/sec in letter-quality mode for the CI-300. The CI-600 doubles those rates for an extra $1500 on the $8599 price-tag of the CI-300.

The CI-300 and CI-600 offer most of the features users have come to expect from dot-matrix printers, such as compressed and expanded print, block and high-resolution graphics, lower-case letters with descenders, underlining, superscripts and subscripts. But, in order to maintain a high throughput, the quality of the print does suffer.

CI-600 high-speed printer from C.Itoh.

The full C.Itoh printer range is supported by Warburton-Franki's national electrical equipment dealer network.

Warburton-Franki,
1-5 Carter St,
Lidcombe, NSW 2141.
Tel: (02) 648 1711.
C.Itoh 8510A available from
Barson Computers,
335 Johnston St,
Abbotsford, Vic 3067.
Tel: (03) 419 3033.

CP-80/CP-1018

Another repackaged version of the Shinwa 80 char/sec printer is the CP-80 — also sold as the Super CP-80 and the Compumate CP-80 — from Electrical Equipment Ltd (and others).

The CP-80 has a Centronics parallel interface as standard, a serial interface is optional. It also has a 256-byte buffer, a printing speed of 80 char/sec, built-in friction and tractor feed, and most word processing features including superscripts and subscripts. The CP-80 has the same 72 by 216 dots/in resolution as the Amust-80DT, while other versions of this printer differ in resolution.

At $395, the CP-80 is priced slightly higher than most of the other Shinwa printers in the current discount price war.

Electrical Equipment Ltd also distributes the CP-1018 from the same manufacturer. This printer differs from the CP-80 in that it accepts 15in paper, and prints in seven colors.

The CP-1018 uses an 18-pin printhead and an ink pad system to perform the same functions of most dot-matrix printers, except in multiple colors. It has built in tractor and friction feed, a 90 char/sec print speed, all letter quality features and a choice of serial or parallel interfaces.

At $1475, it is the lowest-priced color dot-matrix printer on the market.

Electrical Equipment Ltd
192 Princes Highway,
Arncliffe, NSW 2205
Tel: (02) 597 1155.

DATA PRODUCTS

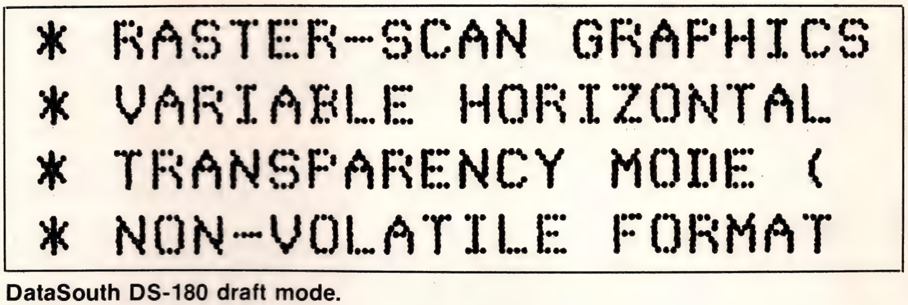
The Data products are descended from the Integral Data Prism which was the leading dot-matrix printer in Australia in 1979. They feature P80 and P132 200 char/sec draft printing with a color printing option priced in the $2000 range. The printers retain their solid block appearance with the distinctive toggle operator controls positioned on top of the printer behind the paper opening.

Using a staggered nine-pin head the printer can print 200 char/sec in draft mode with slower speeds from 150 to 110 char/sec using a denser print matrix. A standard range of character densities is offered with vertical carriage control in 1/48th inch increments and a graphics resolution of 84 dots/in in both directions. A wide range of character fonts including six European, scientific, APL and Greek Maths are available.

Distinctive features include operator selectable form length from 3in to 15in and any length under software control. A unique 200 sheet capacity sheet feeder priced at $630 fits underneath the printer with the paper feed up through the carriage. The color option is available for an extra $500 and offers a choice of four color ribbons with either four primary colors (yellow, cyan, magenta, black).

These printers have retained the distinctive tight, sharp, spikey printed characters of previous models that some people may find awkward but offer high speed printing with an affordable sheetfed mechanism and the option of color printing.

Pericomp,
189 Kent St,
Sydney 2000.
Tel: (02) 27 5953.



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DataSouth DS-180 draft mode.

DATASOUTH

DataSouth is one of the most established names in printers designed for minicomputer and serious microcomputer users, producing two models which differ quite radically from conventional printer design wisdom.

The physical design is the most striking departure from tradition; it has done away with that anachronistic hangover from the typewriter era — the print roller.

Instead, the paper is fed straight over a square metal bar, which must make pin aiming easier as it doesn't need to handle the vagaries of cylindrical roller surfaces.

That change facilitates a long overdue improvement in printer design — the positioning of the paper feed at the front where an operator can get at it easily.

The two DataSouth models also feature an extraordinarily elaborate method of local programming of selectable options — a process which can also be replicated by use of escape sequences from the host computer.

A four-character LED display gives a numerical index to the operator options, which are selected by pressing "plus" or "minus" keys to move forward or backward in numerical sequence. The user, however, needs to refer to the comprehensive manual to check which numbers refer to the various features and the different values they can take, such as baud rates.

The DataSouth printers are often chosen by users with important graphics requirements and, among the range of graphics formats selectable, they offer one concession to industry convention by being compatible with Epson graphics.

While having all programming controls on the front panel makes things easy for the operator, the position of the ribbon pressure adjustment lever — high up inside the cover — makes for an extremely difficult operation.

Kenelec (Australia) Pty Ltd,
48 Henderson Road,
Clayton, Vic 3168.
Tel: (03) 560 1011.

DEC LA50/LA100

Many computer professionals first encountered dot-matrix printers as send/receive Dec terminals, and Dec's affair with the dot-matrix printhead continues today. Two of the Dec printers marketed against the middle-level microcomputer printers are the LA50 and the LA100.

At $1178, the LA50 is not very competitive, since it has a draft mode speed of only 100 char/sec, although the enhanced print mode speed of 50 char/sec is better than that offered by many other printers in this price range.

The LA50 includes all the word processing features found on this type of printer, has a serial interface only, a 2K-byte buffer, high-resol-

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The special user interface called 'B-Shell' allows the use of industry standard software, while being much 'friendlier' than most CP/M systems. 'ICONS' are used to select commonly used programs. INIT and TRANSFER programs simplify 'housekeeping' function.

A comprehensive HELP system is also supplied.

The CP/M 2.2 operating system fully utilises the capabilities of the 128K SBC. Automatic disk caching increases program speed by 50%. 'M-drive' software allows 65K of RAM to be used as a fast disk. SETDRIVE allows other disk formats such as KAYPRO, IBM, OSBORNE to be read.

In its review of the leading Australian computer manufacturers in October 1983, Australian Micro Magazine claims:

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. . . it is listed on IDC's market predictions for this year.”

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Manuals Supplied:— **microbee** disk manual (describes use of CP/M utilities and system specification); Microworld BASIC; Microsoft BASIC; Microsoft Multiplan; Wordstar Reference and Training Manual; Wordbee User Guide.

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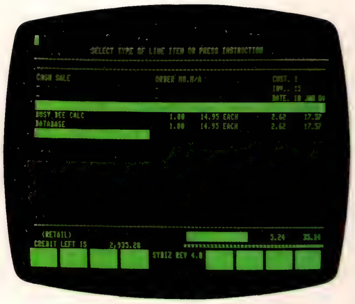
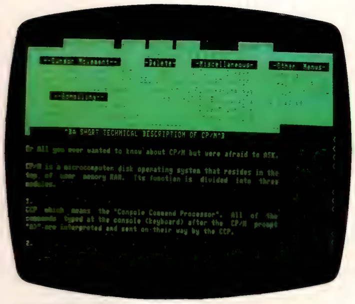

***SYBIZ — Accounting**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User interface	B-Shell
Wordprocessing	WORDSTAR 3.3
Spreadsheet	MULTIPLAN 1.05
Accounting, Pay Roll etc.	SYBIZ Business Package
BASIC	MICROSOFT, MICROWORLD
PCG high res. graphics	512 by 256 pixels
Communications	TELCOM 2
Terminal emulation	ADM 3A/TELEVIDEO
Serial Port RS232	INCLUDED
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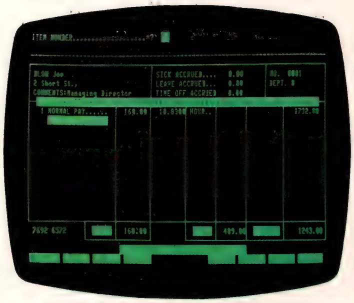
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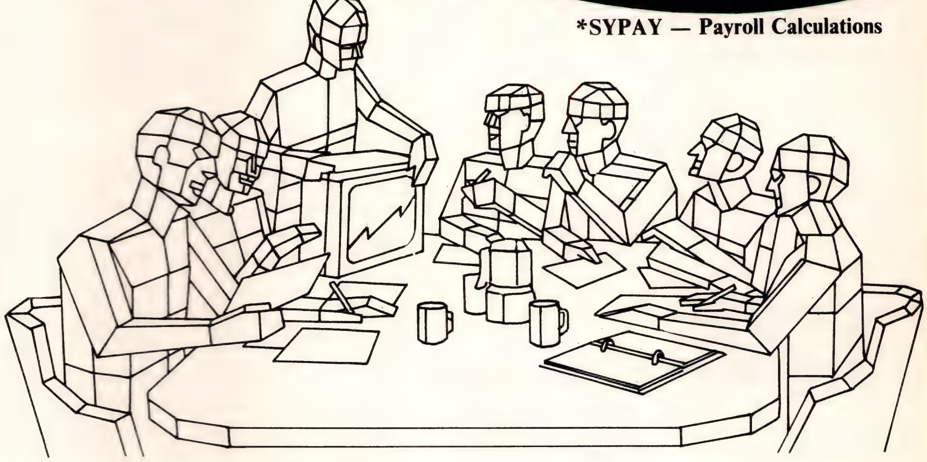

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ution graphics (not compatible with IBM PC printer graphics), built-in friction and tractor feeds, and will accept paper up to 10-in wide.

The bigger brother to the LA50 is the LA100 Letterprinter.

For $2596 it offers two print modes: 240 char/sec draft mode, and 30 char/sec letter-quality mode. A third mode is optional: 80 char/sec correspondence mode. The LA100 has as an option the provision of selectable fonts, including font cartridges.

Other features of the LA100 are high-resolution graphics including VT100 line drawing graphics, friction feed, serial interface, and communications capability. Options include tractor feed, parallel interface, 4K-byte buffer, and font selection cartridges. Strangely, it lacks proportional printing mode, a feature found on most of the competing machines.

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Anderson Digital Equipment Pty Ltd
14 Whiteside Road
Clayton, Vic 3168.
Tel: (03) 544 3444.

EPSON

The leading manufacturer and distributor of dot-matrix printers for microcomputers is Epson, which now holds about 55 per cent of the Australian market. For many years, if you had a dot-matrix printer, it wore the Epson name or was a rebranded and recased variant of the standard Epson line.

Thanks to the IBM PC, Epson's market position is virtually unassailable, with even its competitors boasting "Epson compatibility". The only difficulty Epson faces is that most its market may disappear under the onslaught of printers such as the Nec Pinwriter, which has better features.

Epson manufactures six printers, ranging from an entry-level model with few features to a letter-quality model using a multi-bank print head.

Epson's entry-level RX-80 sells for less than $600 and has all the features of mainstream dot-matrix printers, including multiple type fonts, superscripts and subscripts, high-resolution graphics, bi-directional printing with logic seeking, and a 100 char/sec speed. But it has only tractor feed, and a maximum paper width of 10in.

The manual, while providing enough detail for users to set up the printer, does not provide enough details for interfacing with non-IBM PC microcomputers (if it is using the serial interface) and does not explain the printer's graphics capabilities sufficiently — a fault common to most dot-matrix printers.

The RX-80F/T, priced at slightly more than $700, is slightly higher than the RX-80, and weighs 10kg. It offers friction feed and a second character set to justify its higher price compared with the RX-80.

The RX-100, at more than $1000, accepts 15in paper, has friction feed and an extra character set, and allows minor changes to be made to the control logic for graphics printing.

The FX-80 and FX-100 constitute Epson's middle-range printers. They are similar to their RX counterparts, except that the FX-80 has friction feed and sprocket feed with optional tractor feed. Both print at 160 char/sec in draft mode, and have a proportional printing mode (no speed for this mode is given on the specification sheets).

Like all Epson dot-matrix printers, a parallel interface is standard, with serial optional. The controls are unchanged from the RX models, but the FX-100 is higher, wider and heavier than the RX-100.

Despite the high speed rating, the FX-100 has throughput problems, mainly because of a slow paper slew rate. Continuous paper is also difficult to load and the printing noise in unacceptably high for offices, the intended home of this printer. It is unfortunate that slim, stylish lines also mean a reduction in soundproofing.

The LQ-1500 is a significant departure from Epson's usual printer line. This model prints at 200 char/sec (draft) and 67 char/sec (proportional letter-quality) on a

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maximum paper width of 15in. To achieve high-quality print in letter-quality mode, the LQ-1500 uses a 24-pin print head, with the pins arranged in a 3 by 8 staggered array.

Options include tractor feed, automatic sheet feed, and multiple type fonts. The interface is optional parallel or serial (neither is standard).

Controls are unchanged, with the exception of a sheet load control. The DIP switches for the interface and option boards can be reached easily.

Priced at more than $2200, the LQ-1500 is cheaper than a daisy-wheel or thimble printer with the same throughput and has the added advantage of producing fast draft copy. When it was released, its only real competition was the Toshiba P1350, and the LQ-1500 was cheaper. But the Nec Pinwriters now offer more features at substantially lower prices, leaving the Epson with no real market.

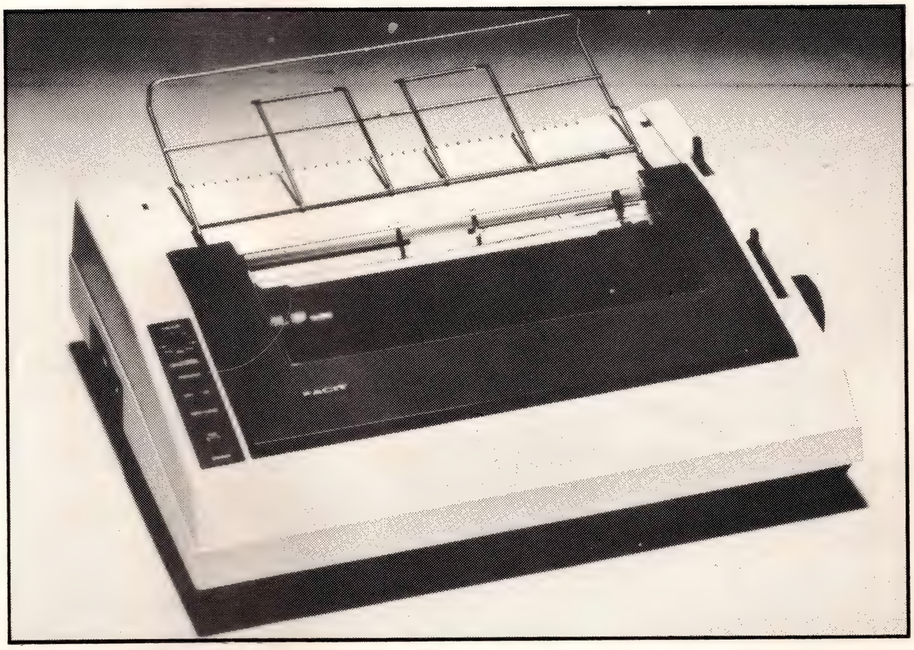
The future of the Epson dot-matrix printer range is unclear. The low end is subject to increasing competition, while the high end offers too few features for the prices asked. In terms of print quality, speed, throughput, and reliability, the Epson range offers no great advantage over cheaper alternatives and has some disadvantages compared with higher-priced competition.

Epson Australia Pty Ltd,
Unit 3, 17 Rodborough Rd,
Frenchs Forest, NSW 2086.
Tel: (02) 452 5222.

FACIT

Facit, a Swedish company, makes a range of dot-matrix printers of high quality and unique design. Only a few of these are distributed in Australia, where they enjoy a growing popularity, especially with government departments.

The bottom of the line is the Facit 4510, priced at $915, a narrow carriage model with tractor and friction feed, and a draft speed of 120 char/sec. This model also features a correspondence mode (either proportional or monospaced), although the quality of draft type is quite good.


The Facit 4510, at the low end of the Facit range.

Other features include three modes of high resolution graphics, block graphics, 10, 12 and 16.7 char/in character sizes, serial and parallel interfaces, a 2K-byte buffer, and the ability to set character pitch from a rotary control on the operator's panel.

The Facit 4511 ($1030) is functionally similar except that it has Epson/IBM printer compatibility.

The Facit 4512 ($1250) is similar to the 4510, except that it will accept 15in paper, has a speed of 140 char/sec, a slightly higher graphics resolution, and uses a slightly denser matrix for correspondence printing. It is available with a variety of interfaces to suit most of the microcomputers selected for school use by the various State education authorities.

The Facit 4512, also has an optional IBM PC character generator, and comes standard with Epson/IBM PC graphics resolution.

The Facit 4526E ($2495) is suited to more advanced applications, with a speed of 165 char/sec in draft mode, plus a slightly faster DP mode. Printing fonts are the same as for the lower level Facits.

Other features include wide carriage, tractor feed only, three modes of high resolution graphics, choice of serial or parallel interfaces, downline loadable character set with option for four additional fonts, and an additional 2K-byte buffer.

A more heavily-featured Facit, the 4528, with similar specifications to the 4526E, is available for $2750.

The Facit 4542, at $4000, is the top of Facit's dot-matrix printer range. Draft speed is 250 char/sec, with proportional and letter quality modes, and the printer can also accept paper up to 18in wide.

Features include tractor feed only, high-resolution and block graphics, 2K-byte buffer, optional 8K-byte buffer, optional downloadable character sets, and a choice between serial and parallel interfaces.

Although there was not time to give more than a cursory examination to the Facit printer range, my past experience with these printers is that they are generally reliable and robust machines, easy to install and use, are backed by excellent third-party national service network, and represent good value for money.

The only difficulty with Facit printers is that the range offered changes with alarming frequency and, although this does not mean that a user will be left with an orphan, it may mean a smaller circle of friends with

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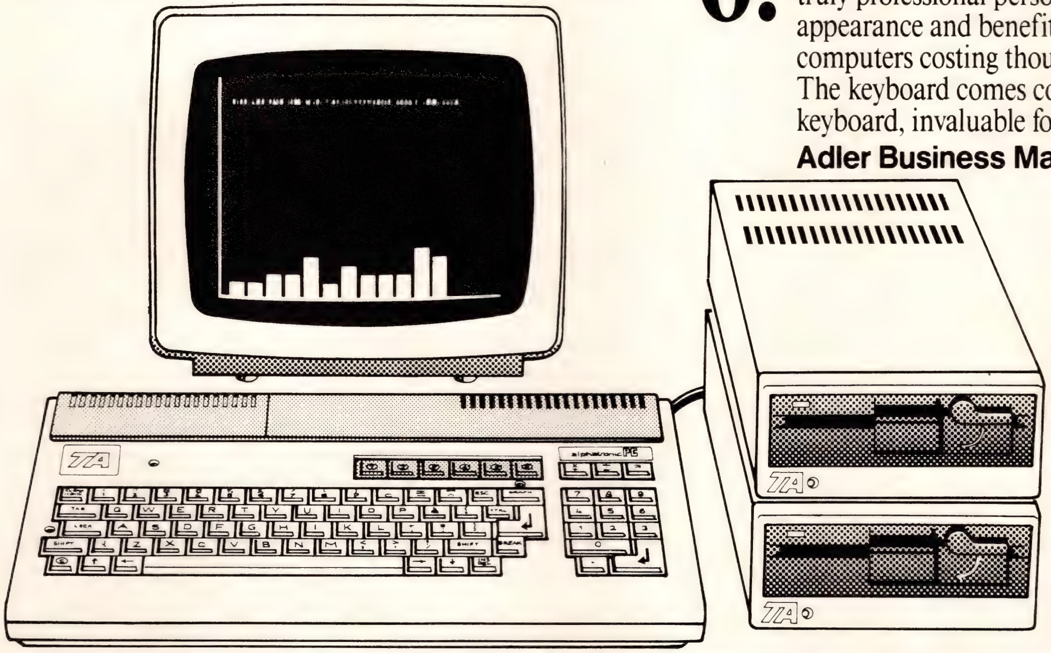

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FLORIDA DATA OSP 130

The Florida Data OSP 130 is a heavy-duty high-speed multi-mode printer. For $7140 it offers 600 char/sec draft mode, 150 char/sec correspondence mode and 100 char/sec NLQ mode, a serial interface, friction and tractor feed, cut sheet feeder, programmable pitch and font selection (including proportional spacing) and internal diagnostics.

The claimed print speed is a good measure of throughput, with the paper seeming to be thrown out as fast as you would expect from a line printer. Florida Data claims that the printhead can stand the strain because of an advanced design with fewer moving parts.

Mitsui Computer Systems Pty Ltd,
1-3 Rodborough Rd,
Frenchs Forest, NSW 2086.
Tel: (02) 451 7711.

FUJITSU DPL24

One printer gaining increased attention for high throughput is the 24-pin printhead Fujitsu DPL24. For around $2500 it offers 160 char/sec print speed (10 char/in) in draft mode, and 80 char/sec in correspondence mode in several fonts, as well as high-resolution graphics.

Features of the DPL24 include push tractor feed and friction feed, parallel interface (serial optional), 5in/sec paper slew speed, optional cut sheet feeder, 13.6in print line on paper up to 16in wide, and a cassette ribbon system.

Thorn EMI Technology,
301 Castlereagh St,
Sydney, NSW 2000.
Tel: (02) 2 0912.

GENICOM 3000 SERIES

General Electric manufactures eight dot-matrix printers suitable for microcomputer use.

All the printers are similarly designed with the differences between the basic models being limited to number of printing modes and maximum printing speed. The two models designed specifically for use with personal computers (the 3014 and 3024) have extra features to allow Epson compatibility.

The six general-purpose Genicom 3000 series printers are compact, functionally styled, microprocessor-based table-top units, available with print speeds in draft mode from 180 char/sec (the 3180) to 400 char/sec (the 3404). These printers are intended for general-purpose applications including small business computing, data communications and dedicated minicomputer-based systems where a medium to heavy-duty cycle reliability is required.

A standard feature is dot-addressable graphics with horizontal and vertical resolution of 72 or 144 dots/in for bar codes as well as block, character and business graphics. Some of the models (3184, 3304 and 3404) are capable of producing near letter-quality characters at speeds of up to 100 char/sec, making the printers suitable for use in word processing.

An option on two models (3300, 3304) is an EDP print mode which produces less well-formed characters than draft mode but with an increase in throughput of up to 40 per cent.

All models include a six-pin adjustable tractor feed before the print line, and a friction feed mechanism with the platen ahead of the print line (the print head impacts on a metal print bar instead of the platen). Paper handling options include single and dual automatic sheet feeders and a single document inserter.

Separate motors are used for paper movement, carriage motion and ribbon drive (in most printers the ribbon is driven from the carriage motor), and the ribbon is in a cassette that includes a self-threaded guide that snaps onto the print head (no more dirty fingers when changing ribbons).

The printers include an RS232C/V.24 serial interface and connector and a Centronics parallel interface connector, but with only circuitry for the serial interface (9600 bits/sec maximum) supplied. A high-speed parallel interface (100K-bytes/sec) is available for $250 extra. If both interfaces are installed, either may be selected by software control.

Depending on the model, characters are printed by either a 9-wire head (3180, 3184 and 3300) or an 18-wire (staggered or parallel 9-wire array) head.

All models have a line length of 136 characters at 10 char/in, and a fast paper slew of 10in/sec (15in/sec for the 3400 and 3404 models).

The printers are controlled by 10 membrane switches on the front panel together with an LED display used for indicating faults as well as printer status and mode selection. All functions can also be controlled through software.

All models in the 3000 series are relatively quiet. The noisiest is the 3404, with a rating of 63.5 decibels when operating at 400 char/sec. The slower models are claimed to be quieter by several decibels.

The Genicom 3000 printer is supplied with two manuals, one for the user (explaining setup and the use of the programmable control panel) and one for service personnel (covering such topics as replacing print heads and modifying the serial interface).

All adjustments (except to the serial interface) are relatively easy to understand and use. Part of the case has to be removed to access the DIP switches for serial interface but this

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is only a minor annoyance as all other features are controlled via the front panel or through software. Another noticeable, but minor, deficiency is the use of a 512 byte buffer instead of the 2K-byte buffer found on most dot-matrix printers.

All printers in the "mainline" Genicom 3000 series have the same overall dimensions: 16cm high, 63cm wide 40cm deep, and weighing 15kg. Models may be modified to a smaller width or lower height, and the top-of-the-line models (3184, 3304, 3404) can have a color-printing mechanism installed. The 512 bytes can also be increased to 8K-bytes.

Prices for the Genicom 3000 series printers range from $2765 for the 3180 model to $3600 for the 3404 model (most basic version price with no options).

Two other models in the Genicom 3000 series are the 3014 and 3024 printers, designed specifically to compete with the Epson MIX with Graftrax and the Oki Microline 84/2 for use with the IBM PC. Because of the need to compete with these printers (and with IBM's own dot-matrix printer), some specifications have been changed, and new features added.

The 3014 and 3024 are fractionally smaller than the other 3000 series printers, but share with them the use of a built-in tractor feed before the print line and a metal print bar. Maximum print line length is reduced to 132 characters at 10 char/in pitch, but horizontal resolution is increased to 204 dots/in.

There is no EDP print mode, but an italic font and provision for a downloadable font are included. The near letter-quality mode is less than a quarter of the speed of the draft mode. The draft mode speed is either 160 char/sec (3014) or 200 char/sec (3024), with no other differences between the two models.

The control panel is simplified from that supplied on the other 3000 series printers, and offers few features. On the other hand, both serial and parallel interfaces are supplied as standard, and they are selectable by either front panel control or through computer software.

The print head is only 9-wire, and no color option is available. The buffer is 2K-bytes, expandable to 8K-bytes. Throughput is reduced from the other 3000 series printers because of a slower slew rate of 7in/sec. An automatic document inserter and a single-bin sheet-feeder are optional.

The DIP switches that must be set to adjust the serial protocol and Epson/Microline emulation are easily accessed, being located immediately in front of the ribbon cassette.

The manual is well-written, although unclear in some places and a little light on technical detail. It incorporates additional details for interfacing the 3014 and 3024 printers with the IBM PC, the TRS-80 Model I and Model III, and the Heath/Zenith PC.

Prices are about $1850 for the base model 3014 and $2290 for the 3024. Cables cost extra.

The Genicom 3014 and 3024 represent good value — probably better value than the Epson printers and on a par with the C.Itoh range.

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Pace Computer Services,
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HI-G 9/80 and 9/132 PS

Kenelec markets two printers from the Hi-G Printers Corporation of the US. The 9/80 and the 9/132 offer similar features, except that the 9/132 will accept 15in paper (10in maximum for the 9/80) and is slightly faster (165 char/sec draft mode and 82.5 char/sec correspondence mode against 150 char/

sec draft mode and 75 char/sec correspondence mode for the 9/80).

Both printers have parallel and serial interfaces as standard, tractor feed only, capability for high-resolution graphics, cartridge ribbon system, a 3K-byte buffer, but a slow paper slew rate of only 2.5in/sec.

At $1596 and $2004 respectively, the printers are competitively priced against the bulk of printers at this level, but not against the newer generation of multi-mode and multi-font printers.

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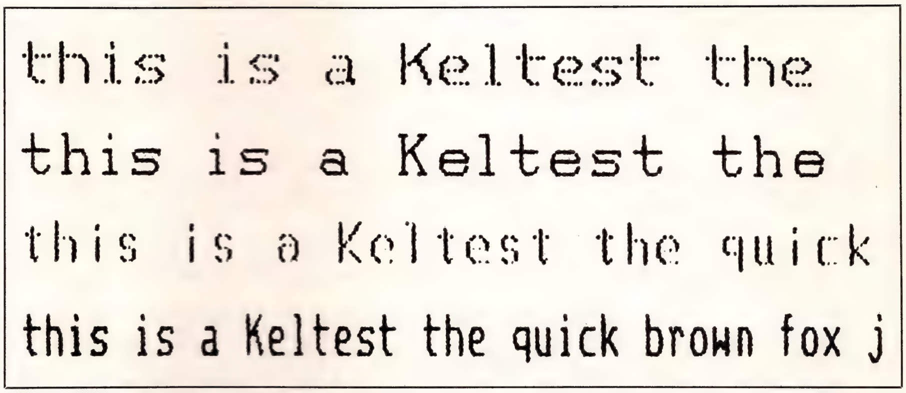

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Print sample from the KEL 3180, showing twice magnified 10 and 12 pitch draft and NLQ print.

IMPRESSIONS SC-1000

A printer designed to steal sales from the Amust-DT80s and similar, the Impressions SC-1000 has been superseded before it has managed to achieve many sales in Australia. It is, in fact, a Copal SC-1000 which, instead of being an Epson clone, is a C Itoh clone, and generally retails at less than $600 under a variety of names including the Impressions SC-1000, the Sakata SP-1000 and the Nissei Sangyo WP-1000. It is shortly to be replaced by a 120 char/sec version, but with similar features.

For $495 you get 100 char/sec draft mode, plus a proportional spacing mode at an undisclosed speed, high-resolution and block graphics, parallel and serial interfaces, friction and tractor feed (maximum paper width of 10in), cassette ribbon system and a 2K-byte buffer.

But you do not get a double-density or NLQ print mode. Still, a 50 per cent increase in speed for only a 20-30 per cent increase in cost is not a bad deal.

The use of a cassette ribbon system is the first obvious cost-cutting measure, as is the simplified (two button) control system. But elsewhere the SC-1000 has been better thought out than most other low-cost dot-matrix printers. The DIP switches are accessible, push tractors instead of pull tractors have been used (reminiscent of C Itoh design, with the removable tractor cover), and the manual is well written and illustrated, with more details than you get with much higher priced printers.

The Copal SC-1000 can be called a clone, but it is unfairly derogatory to call it a cheap one.

Software Australia,
2 Somerfield St,
Mount Gravatt, Qld 4122.
Tel: (07) 349 4877.

KEL 3180

A new entrant on the dot-matrix printer scene is the KEL 3180, manufactred by Kanematsu. At $1695 and 180 char/sec, it falls between the 160 char/sec and the 200 char/sec printers in both speed and price, and offers features that do not really distinguish it from the rest of the market — except that it has an 18-pin print head!

The effect of the 18-pin head is a little different than you might expect: rather than two parallel banks of nine pins, there is a single vertical bank of 18 pins. In high-speed draft mode, there is no visible vertical dot separation, and the characters are fully formed (except for the half-sized descenders).

Because of this pin arrangement, the KEL's draft print mode is the clearest and cleanest I have seen on a dot-matrix printer, with large, sharp, fine letters.

Other features include built-in friction and tractor feed, choice of serial or parallel interface, high resolution and block graphics, paper-out and cover-open warnings, multiple print modes including expanded print in all modes, and a choice of serial or parallel interfaces.

The KEL 3180 accepts paper up to 15in wide (the 3080 model not distributed in Australia is the narrow carriage version).

This printer is let down by the poorly produced manual. It seems to be a temporary version and, although much better than those which users have been accustomed to in the past, is not as good as the latest offerings. Another problem is that it is not Epson/IBM compatible, which will cause problems in interfacing it with most word processing packages.

Overall, I found the printer to be intriguing, good quality, and as fast as the claims made for it.

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designed to compete against the Epson range, not only in features but also in appearance. These are normally sold under the Logitec name, but the occasional instance of rebranding has occurred.

Bottom of the range is the Logitec FT-500 now superseded by the FT-5002 but still available from some suppliers. At $450 but with fewer features than the Amust-DT80 including an 80 char/sec print speed, it is not a bargain.

The Logitec FT-5002, with a print speed of 120 char/sec, has the same features and capabilities as the Epson FX-80, and for a reduction in print speed to 120 char/sec and losing the proportional printing mode, the price is more than halved to $450.

Features of the FT-5002 include subscripts and superscripts, italics, expanded and compressed print, friction and tractor feed, parallel (optional serial) interface, IBM PC matrix and graphic printer modes, and a 10in carriage.

The Logitec FT-6000 and the wide carriage FT-7000, at $985 and $1495 respectively, are aimed at a more sophisticated market. These printers feature 140 char/sec draft mode printing, with near letter-quality at about one quarter of that rate.

The printers also have friction and tractor feed, parallel interface (serial optional), multiple character sets in ROM, downloadable character sets, high resolution and block graphics, and a cassette ribbon system.

Although the documentation is not explicit on this point, it appears that the FT-6000 and FT-7000 will also print near letter-quality mode with proportional spacing. This places these printers somewhere between the Epson FX and LQ series in terms of abilities (in spite of having only a 9-pin printhead), but still only at the FX price bracket.

Digital Source International Pty Ltd,
169 Phillip St,
Waterloo, NSW 2017.
Tel: (02) 690 1268.
Ampec Electronics Pty Ltd,
114 Terry St,
Rozelle, NSW 2039.
Tel: (02) 818 1166.
Micro Buff,
499 High St,
Mt Waverley, Vic 3149.
Tel: (03) 277 7754.

MANNESMANN TALLY

US manufacturer Mannesmann Tally makes one of the most extensive ranges of dot-matrix printers on the market, from a 400 char/sec unit with 100 char/sec near letter-quality mode down to an 80 char/sec conventional Epson compatible.

Most are wide printers, taking 15in paper and printing a full 132 columns, and Australian distributor ADE usually places them with customers as soon as each shipment arrives. But the two 80-column printers present more of a marketing challenge.

Tally's undoubted quality is not as important as price to computer buyers. This forces ADE to discount the low-end Spirit model, leaving the impressive Tally 160 without a strong market segment, unlike its wider brother, the 180.

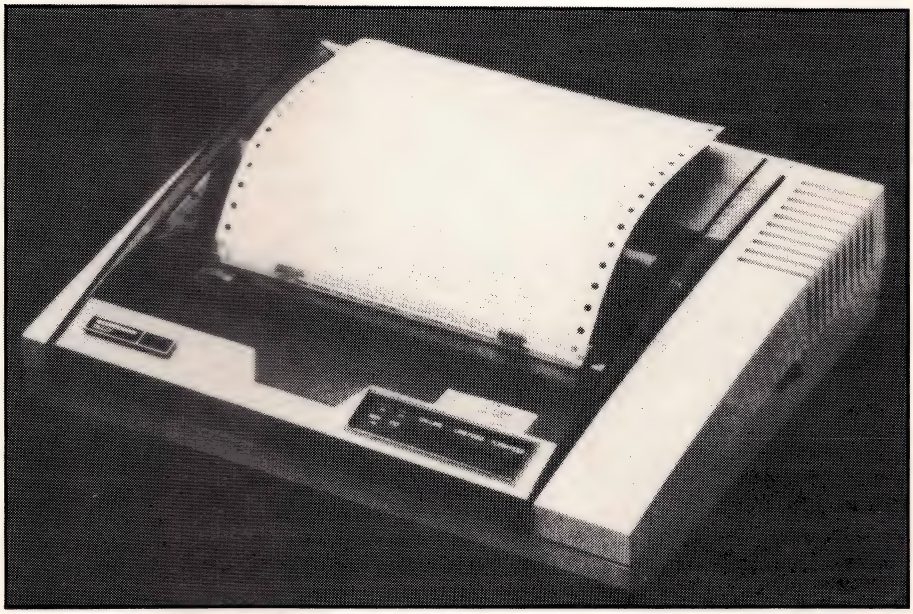
Lift the cover off the 160 and you'll see that it is built like a tank, with cast metal plates ensuring maximum stability — but there's certainly no pretence of the kind of transportability usually associated with Epson compatibles.

In contrast to the standard package of technical documentation churned out with cheaper models, the 160's documentation is pocket-sized, and that is just about sufficient because inbuilt intelligence guides the operator.

Among the 160's six conventional flat touch lights are two labelled "yes" and "no": these are the keys to an extremely simple interactive method which lets the user select his requirements from the multitude of format combinations available.

Initially, the printer lists the current format settings, and the operator simply hits the "no" button to say that they are not acceptable. The printer then automatically steps through a series of printed prompts which the operator answers by pressing the appropriate button, or terminates the sequence when all changes are specified.

The only learning required is remembering the headings for such features as near letter-quality printing — and, possibly, some two-button short-cuts which provide frequently used setting changes



Another Shinwa mechanism in a different case: the Mannesmann-Tally Sprint.

without going through the hard-copy selection procedure. The whole idea certainly is a major improvement on DIP switches.

Anderson Digital Equipment,
PO Box 422,
Clayton, Vic 3168.
Tel: (03) 544 3444.

MITSUI MC2100

Yet another entrant in the low end of the personal computer market is Mitsui's MC2100. For $995 it offers 120 char/sec draft mode and 24 char/sec letter-quality mode. It will accept paper up to 10in wide, has parallel, serial and current loop interfaces as standard, as well as friction and tractor feed. It is also capable of block graphics, but does not appear to have a high-resolution graphics capability.

The MC2100 seems to be an orphan, with only average features and unsophisticated styling.

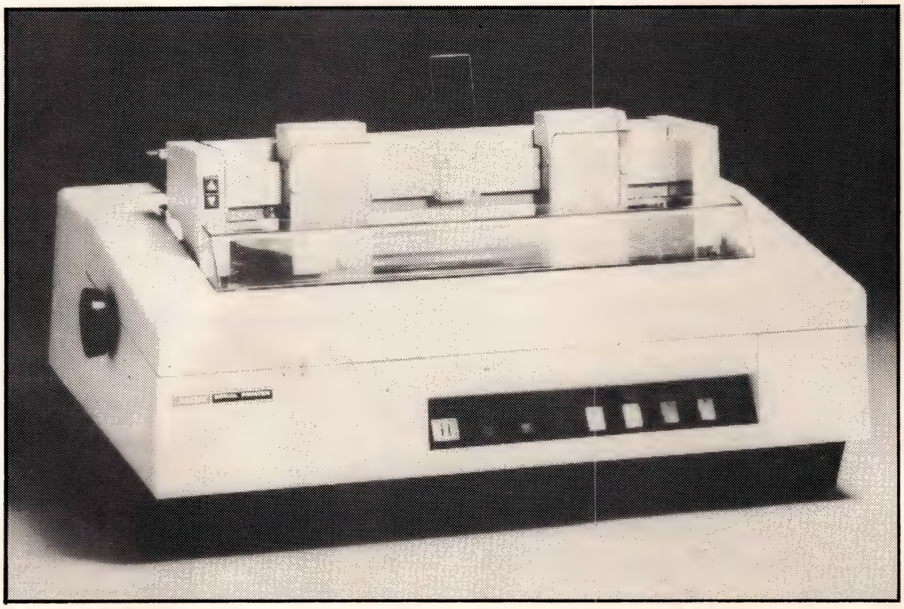
Mitsui Computer Systems Pty Ltd,
1-3 Rodborough Rd,
Frenchs Forest, NSW 2086.
Tel: (02) 451 7711.

NAKAJIMA NP-2200

A lone entrant to the dot-matrix printer market is the Nakajima All NP-2200. For $450, this printer has a 165 char/sec draft mode speed, plus slower proportional and NLQ modes (there is no proportional NLQ combination mode).

The NP-2200 has tractor and friction feed, parallel interface (serial optional), a 10in carriage, high-resolution (Epson-compatible) graphics, normal and italic characters: effectively, it is an Epson FX-80 at half the Epson FX-80 price.

Ampec Electronics Pty Ltd,
114 Terry St,
Rozelle, NSW 2039.
Tel: (02) 818 1166.



The NDK S7.70, high-speed, heavy duty multi-mode and multi-font, with sheet feeder.

NDK 5010/ NDK S7700

Two printers distributed in Australia from the large range manufactured by Nikkyo Electric Industry, suitable for high volume and high duty-cycle applications, are the NDK 5010 Printstar and the NDK S7700 multi-mode printer.

At about $2500, the NDK 5010 joins a crowded market for high-volume printers with speeds less than 200 char/sec. It offers a draft mode speed of 180 char/sec and a near letter-quality mode of 90 char/sec.

Features include a wide carriage, optional tractor feed and single sheet feeder, parallel interface (serial optional), daisywheel printer emulation under WordStar, multiple character fonts (including OCR-B, italic, Titan and Gothic), optional downloadable character sets, high-resolution graphics, and high-speed space skipping.

Although it does not seem to automatically implement proportional spacing (very few dot-matrix do), the high speed NLQ mode, when added to the multiple font feature, makes the NDK 5010 one of the best multi-mode dot-matrix printers available, and at an extremely competitive price.

The NDK S7700 offers similar print speeds to the NDK 5010 (plus a proportional mode at 110 char/sec), but its 8086 microprocessor allows it to handle several daisywheel emulations including Qume Sprint 5, Diablo 1610 and Nec Spinwriter.

For about $3870 you get seven character fonts that can be printed in draft, letter-quality, proportional or italic styles, friction and tractor feed, wide carriage, optional dual-bin sheet feeder, optional downloadable character sets, serial and parallel interfaces built in, high-resolution graphics, and a claimed 100 per cent duty cycle.

Datascape International Pty Ltd,
44 Avenue Rd,
Mosman, NSW 2088.
Tel: (02) 969 2699.
Nissei Sangyo Co Ltd,
200 Pacific Highway,
Crows Nest, NSW 2065.
Tel: (02) 923 1522.

NEC PINWRITER

NEC surprised everyone, including its competition, with the release of the Pinwriter P1, which combined a

The world's most compact printer...

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Trust Brother to be first again. The HR-5 is the smallest, most versatile, fully functional **heat-transfer** thermal printer you can buy and graphically demonstrates the innovation and tremendous flexibility of the growing range of Brother printers.

Big on Performance

Full graphics and all the functionality of a full size, professional printer on a machine that's smaller than a sheet of A4 paper, only 6.5cm (2½") high and weighing less than 1.75kg (4lbs).

Fully Portable

Battery or mains operation (Adaptor is included) means you can print out hard copies whenever and wherever you like. And it fits conveniently into your briefcase or desk drawer.

Variable Printout

The HR-5 certainly measures up with a full 80 columns wide as standard and 132 columns on command.

Compatibility

Optional connecting cables are available for many popular P.C.'s and micros from desk top to hand held, including Commodore and Apple.

Plain or thermal paper

The HR-5 is the only machine in its class to offer this choice, all you need do is remove the ribbbon to change from plain to thermal printing.

Other features

●Roll paper feed. ●Centronics Parallel or RS232C Interface. ●Simple to install. ●Self diagnostics. ●Silent operation. ●30 Characters per second print out.

The HR-5 provides the perfect solution to the problem of professional looking copies at a realistic price.

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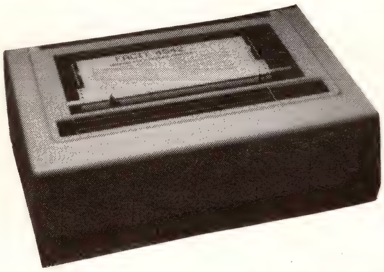
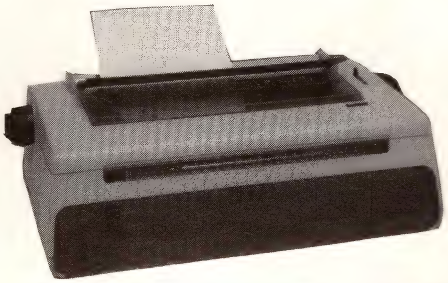


The Facit 4542 (two-colour) and 4544 (four colour) Flexhammer Printers offer you printing and graphics facility. Extremely long print head life, superb precision and excellent print quality is achieved using Facit's unique stored force Flexhammer.

Facit 4560 Letter Quality Printer



The 4560 uses a 112 character print wheel at 22 cps in 10, 12, 15 pitch as well as proportional spacing. It operates at a low noise level (<60dBA) and provides for an optional cut sheet feed or forms tractor. The Facit 4560 is an excellent machine where high quality output is required.

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Facit 4565 letter quality printer

Operating a 40 cps the 4565 uses industry compatible printwheels, ribbons and control commands. The operator can control form length and pitch from the front control panel. This is a superb machine where high quality output is required fast. Cut sheet feeder and bi-directional forms tractors are available as options.

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Artarmon NSW 2064
Telephone: Sydney (02) 427 3322
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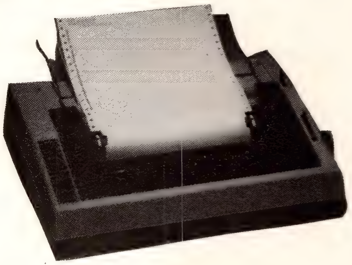
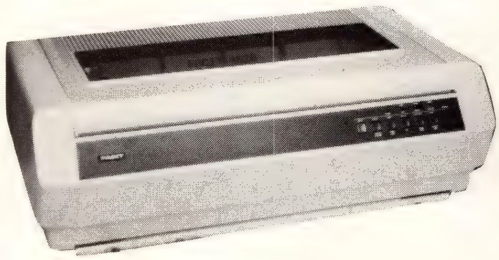
Facit 4510 Matrix Printer



The Facit 4510 matrix printer includes numerous features including a multifont capability — in medium resolution 9 x 9 characters in monospaced 10, 12 and 17 cpi. In high resolution 9 x 15 in monospaced (10 cpi) or proportional block graphics and pin graphics. Switch or software selectable.

Available under NSW Govt. Contract 83/3286

Facit 4528 Text & Label printer

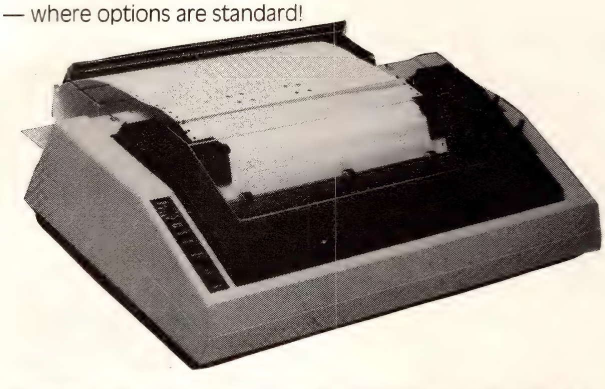


This printer is ideally suited for the label printing needs of a pathology laboratory, food distribution, factory, warehouse or other areas where a decentralised multiple label printing is desired. This new Facit 4528 printer can print variable size characters (up to 9.6 inches high), bar codes, 2 styles of typefont, off line label printing (up to 10,000 documents), character rotation and automatic incrementing and decrementing counters. The straight through paper path allows the use of a wide variety of media including pressure sensitive label stock.

and — for IBM PC users

Introducing Facit 4512 Printer

— where options are standard!



This printer offers three way paper handling: fanfold with tractor feed, back and bottom feed and single sheet with friction feed. Textfont and graphic modes are switch or software selectable and offers the following options, 10CPI, 12CPI, 17CPI, dual pass NLQ, block graphics and pin graphics.

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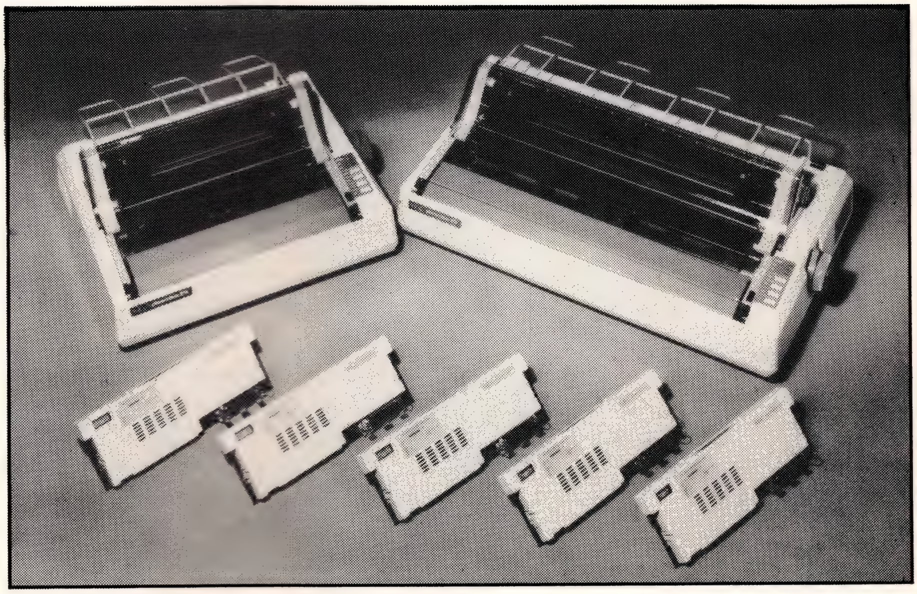

Nec P2 and P3 PInwriters, with modular interfaces in foreground.

high speed draft mode with fast multi-font letter quality. Its pricing at under $1300 undercut the closest competition, the Toshiba P1350, by more than half — and it ended up costing less than the Texas Instruments multi-font TI 855.

The Pinwriter P1 has a draft mode of 180 char/sec, and a proportional spacing letter-quality mode speed of 90 char/sec. It accepts paper up to 10 inches wide, has a built-in friction feed with optional tractor feed and cut-sheet guide, three font sizes (plus expanded versions of each size), high resolution graphics, a cassette ribbon system, and a parallel interface with a 2K-byte buffer.

The printer operates quietly and has easily accessed control DIP switches and an LED indicator for font selection.

Because the Pinwriter P1 was designed before the IBM PC printer features became mandatory, it has been replaced by the P2 and P3 models. Limited stocks are still available at the reduced price of about $1020.

The Pinwriter P2 (the P3 has similar features, except that it will accept paper up to 16in wide) differs from the P1 in several areas. The main difference is that it has a modular design.

The Pinwriter P2 copies the Qume daisywheel feature of detachable interface modules for the major computer brands, except that only three interfaces are available: IBM PC parallel printer, Nec parallel printer, and Nec RS232C serial. If your computer does not happen to be one of these, the DIP switches on the interface module can be set to allow attachment of the printer to most other computers.

The other change to the Pinwriter P2 is an increase in the number of print modes, with the addition of high-density pica proportionally-spaced, double-pass pica and double-pass elite modes. The high-density pica proportionally-spaced mode operates at a lower speed —30 char/sec, despite the 18-pin printhead — and produces an output almost indistinguishable from a daisywheel printer.

Other features of the P2/P3 include high-resolution graphics (120 by 120 dot/in), international character sets, cassette ribbon, 3.5K-byte buffer, and a high reliability. Options include cut sheet feeder, cut sheet guide, unidirectional tractor.

The Pinwriter P2 is easy to use, with surprisingly (for a Nec printer) well-written manuals. The bits and pieces for the various options are not always self-evident in their functions, and the fit for the tractor feed is a little tight.

Good points for the P2/P3 include

Continued on page 106

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HOW THE PRINTERS COMPARE

PRINTERS: LESS THAN 200 CHAR/SEC

NAME	PRICE	INTERFACE	BUFFER SIZE	CHARACTERS PER INCH	LINES PER INCH	HORIZONTAL INCREMENTS	VERTICAL INCREMENTS	CHARACTERS PER SEC	PAPER WIDTH	RIBBON TYPE	UNDERLINING	BOLD/ CONDENSED	TRUE DESCENDER	PROPORTIONAL	DEFINED CHARACTERS	BLOCK GRAPHICS	HIRESIDUAL GRAPHICS	BIDIRECTIONAL	LOGIC SEEKING	TRACTOR FEED	FRICTION FEED	SHEET FEED
ALPS ASP-3500	$2100	S, P	1K	5, 6, 8.25, 10, 12, 16.5	6, 8, 12	—	—	180	16"	CT	☐	☐	☐			☐	☐	☐	☐	☐	Opt	
AMUST-80DT	$390	P,S	—	5, 6, 8.5 10, 13.6, 17	6, 8	1/80	1/216	80	10"	CT	☐	☐	☐				☐	☐	☐	☐	☐	
AMUST P-88	$550	P,S	2K	10,12		—	—	80/40	10"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
AMUST 120 Super	$490	P&S	—	5, 6.8, 8.5 10, 13.6, 17	6, 8	1/72	1/72	120	10"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	☐
ANADEX DP- 9000B	$2018	P,S	3.5K	10, 12, 13.3	6, 8	1/60	1/72	180	10"	CT	☐	☐	☐				☐	☐	☐	☐		
ANADEX DP-9001B	$2018	P,S	3.5K	10, 12.5, 15, 16.7	6, 8	1/75	1/72	180	10"	CT	☐	☐	☐				☐	☐	☐	☐		
ANADEX DP-9500B	$2157	P,S	3.5K	10, 12, 13.3	6, 8	1/60	1/72	180	15"	CT	☐	☐	☐				☐	☐	☐	☐		
ANADEX DP-9501B	$2157	P,S	3.5K	10, 12.5, 15, 16.7	6, 8	1/75	1/72	150	15"	CT	☐	☐	☐				☐	☐	☐	☐		
BMC BX-80	$349	P,S	1 line	5, 9, 10, 17.5	6	1/80	1/72	80	10"	CT	☐	☐	☐			☐	☐	☐	☐	☐	☐	
CANON A-1200	$945	P	—	5, 6, 10, 12,17	3, 4, 8, 12	1/120	1/120	120	11"	CS	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
CANON A-1250	$1295	P	—	5, 6, 10, 12, 17	3, 4, 8, 12	1/120	1/120	140/24	17"	CS	☐	☐	☐		☐		☐	☐	☐	☐	☐	
CENTRONICS H80	$1000	P,S	—	5, 6, 7.5, 8.6 10, 12, 17.2	6, 8	—	—	140/70	10"	CS	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	
C.ITOH 8510A	$1127	P,S	1K	5, 6, 8.5 10, 12, 17	6, 8	1/160	1/144	120	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
C.ITOH 1550B	$1299	P,S	2K	5, 6, 8.5 10, 12, 17	6, 8	1/160	1/144	120	15.5"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
C.ITOH 8510B	$949	P,S	2K	5, 6, 8.5 10, 12, 17	6, 8	1/160	1/144	120	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
C.ITOH 1550S	$1529	P,S	2K	5, 6, 8.5 10, 12, 17	6, 8	1/160	1/144	180	15.5"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
C.ITOH 8510S	$1139	P,S	2K	5, 6, 8.5, 10, 12, 17	6, 8	1/160	1/144	180	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

CP-80	$395	P,S	256 bytes	5, 10, 17.5	6	1/160	1/216	80	10"	CT	☐	☐	☐			☐	☐	☐	☐	☐	☐	
DATASOUTH DS180	$2220	P&S	2K	5, 6, 8 10, 12, 16	6, 8	1/75	1/72	180	15"	CT	☐	☐	☐				☐	☐	☐	☐		
DEC LA50	$1170	S	2K	5, 6 8.25 10, 12, 16.5	2, 3, 4 6, 8, 12	1/180	1/72	100/50	10"	CT	☐	☐	☐			☐	☐	☐	☐	☐	☐	
EPSON FX-80	$1030	P,S	3K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	160	10"	CS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
EPSON FX-100	$1440	P,S	3K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	160	16"	CS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
EPSON RX-80	$595	P,S	—	5, 6, 8.5 10, 12, 17	6, 8, 10	1/240	1/216	100	10"	CS	☐	☐	☐				☐	☐	☐	☐		
EPSON RX-100	$1105	P,S	—	5, 6, 8.5 10, 12, 17	6, 8,	1/240	1/216	100	15.5"	CS	☐	☐	☐			☐	☐	☐	☐	☐	☐	
EPSON RX-80F/T	$725	P,S	—	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	100	10"	CS	☐	☐	☐			☐	☐	☐	☐	☐	☐	
FACIT 4510	$915	S, P	2K	10, 12, 17	6, 8	1/200	1/72	120	11"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
FACIT 4511	$1030	S, P	2K	10, 12, 17	6, 8,	1/200	1/144	120	11"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
FACIT 4512	$1250	P&S	2K	10, 12, 17	6, 8,	1/200	1/144	140	15"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	Opt
FACIT 4526E	$2495	P,S	540 bytes	10, 12, 17	6, 8	—	—	165	15"	CS	☐	☐	☐	☐	☐		☐	☐	☐	☐		
FACIT 4528	$2750	S, P	540 bytes	10, 12, 17	6, 8	—	—	165	15"	CS	☐	☐	☐	☐			☐	☐	☐	☐		
FUJITSU DPL24	$2500	P, S	2K	10, 12, 18	3, 4, 6, 8, 12	1/360	1/180	160/80	16"	CS	☐	☐	☐		☐		☐	☐	☐	☐	☐	Opt
GENICOM 3014	$1847	P&S	2K	5, 6, 6.5, 7.5, 8.5 10, 12, 13.1, 15, 17	6, 8	1/204	1/144	160/32	15.5"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt
GENICOM 3180	$2767	P	512 bytes	10, 12, 13.1 15, 16.7	3, 4, 6, 8, 12	1/144	1/144	180	15.5"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	
GENICOM 3184	$3036	P	512 bytes	10, 12, 13.1, 15, 16.7	3, 4, 6, 8, 12	1/144	1/144	180	15.5"	CT	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	Opt
HI G 9/80	$1596	P&S	3K	10, 12, 16.5	6, 8	1/72	1/72	150/75	10"	CT	☐	☐	☐		☐		☐	☐	☐	☐		
HI G 9/132	$2004	P&S	3K	10, 12, 16.5	6, 8	1/72	1/72	165/82.5	16"	CT	☐	☐	☐		☐		☐	☐	☐	☐		
SC-1000	$495	P&S	2K	5, 6, 8.5 10, 12, 16.5	6	1/180	1/60	100	10"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
KEL 3180	$1695	P,S	2K	5, 6, 8.5 10, 12, 17, 20	6, 8	1/240	1/120	180/90	15"	CS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
LOGITEC FT-5000	$450	P,S	—	5, 6, 7, 8.5 10, 12, 14, 17	6, 8	1/144	1/144	80	10"	CS	☐	☐	☐			☐	☐	☐	☐	☐	☐	
LOGITEC FT-5002	$450	P,S	1K	5, 6, 8.5, 9.5 10, 12, 17, 19.5	6, 8	1/240	1/216	120	10"	CT	☐	☐	☐			☐	☐	☐	☐	☐	☐	Opt

PRINTERS: LESS THAN 200 CHAR/SEC continued

NAME	PRICE	INTERFACE	BUFFER SIZE	CHARACTERS PER INCH	LINES PER INCH	HORIZONTAL INCREMENTS	VERTICAL INCREMENTS	CHARACTERS PER SEC	PAPER WIDTH	RIBBON TYPE	UNDERLINING	BOLD/ CONDENSED	TRUE DESCENDER	PROPORTIONAL	DEFINED CHARACTERS	BLOCK GRAPHICS	HIRESIDUAL GRAPHICS	BIDIRECTIONAL	LOGIC SEEKING	TRACTOR FEED	FRICTION FEED	SHEET FEED
LOGITEC FT-6000	$985	P,S	256 bytes	5, 6, 10, 12, 17	6, 8	1/120	1/120	140/70	10"	CS	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
LOGITEC FT-7000	$1495	P,S	256 bytes	5, 6 10, 12, 17	6, 8	1/120	1/120	140/70	17"	CS	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
MANNESMANN-TALLY SPIRIT	$355	P, S	—	5, 9, 10, 17	6	1/160	1/72	80	10"	CT	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
MANNESMANN-TALLY MT 160	$1055	P, S	2K	5, 6, 8, 10 12, 16.5, 20	6, 8	1/128	1/133	160/40	10"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	
MANNESMANN-TALLY MT 180	$1520	P, S	2K	5, 6, 8, 10 12, 16.5, 20	6, 8	1/128	1/133	160/40	16"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	
MICROLINE 82A	$1200	P&S	80 bytes	5, 10, 16.5	6, 8	—	—	120	9.5"	SP	☐	☐	☐			☐	☐	☐	☐	☐	☐	
MICROLINE 83A	$1580	P&S	136 bytes	5, 10, 16.5	6, 8	—	—	120	16"	SP	☐	☐	☐			☐	☐	☐	☐	☐	☐	
MICROLINE 92	$1120	P,S	256 bytes	5, 6, 8.5 10, 12, 17	6, 8	1/72	1/72	160/40	9"	SP	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	
MICROLINE 93	$1680	P,S	256 bytes	5, 6, 8.5 10, 12, 17	6, 8	1/72	1/72	160/40	16"	SP	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	
MITSUI MC2100	$995	S, P	1K	5, 10 12, 15, 16.5	6, 8	—	—	120/24	10"	CS	☐	☐		☐	☐	☐		☐	☐	☐	☐	
NAKAJIMA NP-2200	$450	P,S	2K	5, 6 10, 12, 17	6, 8	—	—	120	10"	SP	☐	☐	☐			☐	☐	☐	☐	☐	☐	Opt
NEC PINWRITER P1	$1020	P	2K	10, 12, 17	3, 4, 6, 8	1/120	1/120	180	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt	☐	Opt
NEC PINWRITER P2	$1145	P,S	3.5K	10, 12, 17	6, 8	1/120	1/120	180/30	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt	☐	Opt
NEC PINWRITER P3	$1440	P,S	3.5K	10, 12, 17	6, 8	1/120	1/120	180/30	16"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt	☐	Opt
NDK 5010	$2552	P, S	4.5K	5, 10	6, 8	1/120	1/120	180/90	15"	CS	☐	☐	☐	☐	Opt		☐	☐	☐	Opt	☐	Opt
NDK S7700	$3863	S	512 bytes	10, 12	6, 8	1/240	1/120	180/90	15"	CS	☐	☐	☐	☐	Opt		☐	☐	☐	☐	☐	Opt
NISSEI SANGYO WP-1000	$546	P&S	2K	5, 6, 8.5 10, 12, 16.5	6	1/180	1/60	100	10"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
SAKATA SP-1000	$420	P&S	144 bytes	5, 6, 8.5 10, 12, 16.5	6, 8	1/72	1/72	100	10"	CS	☐	☐	☐	☐			☐	☐	☐	☐	☐	
STAR GEMINI-10X	$539	P, S	256 bytes	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	120	10"	SP	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
STAR GEMINI-15X	$954	P, S	256 bytes	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	120	15"	SP	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	

Our new multimode: Correspondence quality. High-speed drafts. Graphics. Attractive pricing. And up to 500 cps.

Anadex rapidly moves a head.

High quality correspondence.
High-speed drafts.
High-resolution graphics.

Whatever your application, they're all built into the exciting new multimode printer: Rapid/Scribe™ Model DP-6500 from Anadex.

But the built-in feature that's got everybody talking is Rapid/Scribe's speed ...500 characters per second at 10 Pitch in the high speed draft mode; and 110 cps in the proportionally spaced, Dual Pass Correspondence Mode.

The accompanying chart summarizes the speeds. (Notice that at 10 Pitch and 80 Columns, Speed is 275 Lines per Minute).

Equally exciting are the impressive array of features that have become the Anadex hallmarks...friction and tractor feed, sophisticated communications capability, emulation packages, character font downloading, alternate character fonts, bar codes, and of course, a reputation for reliability.

Couple those features with Rapid/Scribe's interfaces – Parallel, Centronics compatible and RS-232-C Serial – and you have a solid, high-speed printer that fits virtually any computer and computer application...including yours.

Printing speeds (cps)	
10 Pitch	500 cps
12 Pitch	540 cps
Enhanced	
Proportional	275 cps
10 Pitch	250 cps
12 Pitch	300 cps
Condensed	
15 Pitch	375 cps
16.4 Pitch	410 cps
Dual Pass Correspondence Quality	
Proportional	110 cps
10 Pitch	100 cps
12 Pitch	120 cps
10 Pitch Printing Speed (lines/minute)	
40 Columns	430 lpm
80 Columns	275 lpm
132 Columns	180 lpm

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PRINTERS: LESS THAN 200 CHAR/SEC continued

NAME	PRICE	INTERFACE	BUFFER SIZE	CHARACTERS PER INCH	LINES PER INCH	HORIZONTAL INCREMENTS	VERTICAL INCREMENTS	CHARACTERS PER SEC	PAPER WIDTH	RIBBON TYPE	UNDERLINING	BOLD/ CONDENSED	TRUE DESCENDER	PROPORTIONAL	DEFINED CHARACTERS	BLOCK GRAPHICS	HIRESIDUAL GRAPHICS	BIDIRECTIONAL	LOGIC SEEKING	TRACTOR FEED	FRICTION FEED	SHEET FEED
STAR DELTA-10	$954	P&S	8K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	160	10"	SP	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
STAR DELTA-15	$1434	P&S	8K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	160	15"	SP	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	
TI 850	$1065	P&S	—	5, 6, 8.3 10, 12, 16.7	3, 4, 6, 8	1/144	1/144	150/90	11"	CS	☐	☐	☐			☐	☐	☐	☐	☐	☐	
TI 855	$1465	P&S	256 bytes	5, 6, 8.5 10, 12, 15, 17	3, 4, 6, 8	1/144	1/144	180/35	11"	CS	☐	☐	☐	☐	Opt	☐	☐	☐	☐	☐	☐	Opt
TOSHIBA P1340	$1675	P&S	—	10, 12, 16.7	6, 8	—	—	93/54	10"	CT	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
TOSHIBA P1350	$2830	P&S	—	10, 12, 16.7	6, 8	1/180	1/360	160/100	15"	CT	☐	☐	☐	☐		☐	☐	☐	☐	Opt	☐	Opt
TOSHIBA P1351	$3370	P&S	—	10, 12, 16.7	6, 8	1/180	1/360	160/100	15"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐		Opt	
TRS-80 DMP-110	$499	P	—	5, 6, 8.5 10, 12, 16.5	6, 12	1/120	1/60	50/25	9"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
TRS-80 DMP-200	$899	P	2K	10, 16.7	6, 8	1/100	1/60	80/45	9"	CS	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
TRS-80 DMP-420	$1499	P	2K	5, 6, 8.3 10, 12, 16.7	6, 8, 12	1/200	1/60	140/84	15"	CT	☐	☐	☐	☐		☐		☐	☐	☐	☐	
TRS-80 DMP-2100	$2699	P	2K	10, 12, 16.7	6, 8, 12	1/180	1/120	160/100	15"	CT	☐	☐	☐	☐		☐	☐	☐	☐	Opt	☐	Opt

PRINTERS: 200 CHAR/SEC OR MORE

NAME	PRICE	INTERFACE[1]	BUFFER SIZE[2]	CHARACTERS PER INCH	LINES PER INCH	HORIZONTAL INCREMENTS	VERTICAL INCREMENTS	CHARACTERS PER SEC[3]	PAPER WIDTH[4]	RIBBON TYPE[5]	UNDERLINING	BOLD/ CONDENSED	TRUE DESCENDER	PROPORTIONAL	DEFINED CHARACTERS	BLOCK GRAPHICS	HIRESIDUAL GRAPHICS	BIDIRECTIONAL	LOGIC SEEKING	TRACTOR FEED	FRICTION FEED	SHEET FEED
ANADEX DP-9620B	$2318	P,S	3.5K	10, 12, 15, 16.4	6, 8	1/72	1/72	240	15"	CT	☐	☐	☐	☐	Opt		☐	☐	☐	☐		
ANADEX DP-9625B	$2512	P, S	3.5K	10, 12, 15, 16.4	6, 8	1/144	1/144	240/67	15"	CT	☐	☐	☐	☐	Opt		☐	☐	☐	☐		
ANADEX WP-6000	$3944	P,S	4.5K	10, 12, 16.7	6, 8, 12, 16	1/144	1/144	230/125	15"	CT	☐	☐	☐	☐	☐		☐	☐	☐	Opt	☐	Opt
ANADEX DP-6500	$4524	P,S	4.5K	5, 6, 7.5, 8.2 10, 12, 15, 16.4	6, 8	1/144	1/144	500/137	15"	CT	☐	☐	☐	Opt	☐		☐	☐	☐	☐	☐	Opt
CENTRONICS 351	$3000	P&S	2K	5, 6, 8.25 10, 12, 16.5	6, 8	1/66	1/72	200	15"	CS	☐	☐	☐	☐			☐	☐	☐	☐	☐	

CENTRONICS 353	$3500	P&S	4K	10, 12, 13.2, 15, 16.5	3, 4, 6, 8, 12	1/66	1/72	200/50	15"	CS	☐	☐	☐		☐		☐	☐	☐	☐	☐	Opt
CENTRONICS 357	$4500	P&S	2K	10, 12 13.5, 15, 16.7	6, 8,	1/66	1/72	400	15"	CS	☐	☐	☐				☐	☐	☐	☐	☐	
C.ITOH CI-300	$8599	P&S	272 bytes	5, 5.8, 6.6, 8.3 10 11.7, 13.3, 16.7	3, 4, 5, 6, 8	1/400	1/144	300/80	16"	SP	☐	☐	☐			☐	☐	☐	☐	☐		
C.ITOH CI-600	$9995	P&S	226 bytes	5, 5.8, 6.6, 8.3 10 11.7, 13.3, 16.7	3, 4, 5, 6, 8	1/400	1/144	600/170	16"	SP	☐	☐	☐					☐	☐	☐		
DATASOUTH DS220	$2640	P&S	2K	5, 6, 8, 10 12, 16	6, 8	1/144	1/144	220/40	15"	CT	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	
DEC LA100	$2596	S, P	325 bytes	5, 6, 6.6, 8.25 10, 12, 13.2, 16.5	2, 3, 4, 6, 8, 12	1/133	1/72	240/30	14⅞"	CT	☐	☐	☐				☐	☐	☐	☐	☐	
EPSON LQ-1500	$2235	P,S	2K	5, 6, 8.5 10, 12, 17, 20	6, 8	1/180	1/180	200/67	16"	CS	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt	☐	
FACIT 4542	$4000	S, P	2K	10, 12, 15	6, 8	—	—	250	18.7"	SP	☐	☐	☐	☐	Opt	☐	☐	☐	☐	☐		
FLORIDA OSP-130	$7140	S	512 bytes	10,18	6, 8 12, 16, 48	1/120	—	600/100	15"	CT	☐	☐	☐	☐	Opt	☐	Opt	☐	☐	Opt	☐	☐
GENICOM 3024	$2290	P&S	2K	5, 6, 6.5, 7.5, 8.5 10, 12, 13.1, 15, 17	6, 8	1/204	1/144	200/40	15.5"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Opt
GENICOM 3300	$3030	P	512 bytes	10, 12, 13.1, 15, 16.7	3, 4, 6, 8, 12	1/144	1/144	200	15.5"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	
GENICOM 3304*	$3384	P	512 bytes	10, 12 13.1, 15, 16.7	3, 4, 6, 8, 12	1/144	1/144	200/100	15.5"	CT	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐
GENICOM 3400	$3330	P	512 bytes	10, 12 13.1, 15, 16.7	3, 4 6, 8, 12	1/144	1/144	400	15.5"	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	
GENICOM 3404*	$3600	P	512 bytes	10, 12 13.1, 15, 16.7	3, 4 6, 8, 12	1/144	1/144	400/100	15.5"	CT	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐
MANNESMANN-TALLY MT 1605	$2641	S	—	10, 16.5	—	1/100	1/72	200/50	15¼"	CT	☐	☐	☐				☐	☐	☐	☐	☐	Opt
MICROLINE 84	$1830	P,S	256 bytes	5, 6, 8.5 10, 12, 17	6, 8	1/72	1/72	200/50	16"	SP	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	Opt
OKI 2350*	$4660	P&S	2K	5, 6, 8.6 10, 12, 17.1	6, 8	1/72	1/72	350	16"	CT	☐	☐	☐		☐		☐	☐	☐	☐	☐	
OKI 2410*	$5050	P&S	2K	5, 6, 8.6 10, 12, 17.1	6, 8	1/144	1/144	350/87	16"	CT	☐	☐	☐		☐		☐	☐	☐	☐	☐	Opt
SHINKO S1310	$2394	P, S	2K	10, 12, 17	6, 8	1/240	1/144	250/60	15.5"	CT	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
STAR RADIX-10	$1536	P&S	16K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	200	10"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
STAR RADIX-15	$1860	P&S	16K	5, 6, 8.5 10, 12, 17	6, 8	1/240	1/216	200	15.5"	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
TIP 300	$12,200	P&S	—	10, 13, 17	6, 8	1/120	1/100	600/150	10"	SP	☐	☐	☐	☐		☐	☐	☐	☐	☐		
TRS-80 DMP-500	$1999	P	2K	5, 6, 8.3 10, 12, 16.7	6, 8, 12	1/200	1/60	220/131	15"	CT	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	

COLOR PRINTERS

NAME	PRICE	INTERFACE	BUFFER SIZE	CHARACTERS PER INCH	LINES PER INCH	HORIZONTAL INCREMENTS	VERTICAL INCREMENTS	CHARACTERS PER SEC	PAPER WIDTH	RIBBON TYPE	UNDERLINING	BOLD/ CONDENSED	TRUE DESCENDER	PROPORTIONAL	DEFINED CHARACTERS	BLOCK GRAPHICS	HIRESIDUAL GRAPHICS	BIDIRECTIONAL	LOGIC SEEKING	TRACTOR FEED	FRICTION FEED	SHEET FEED
ANADEX DP-9725B	$2720	P,S	3.5K	10, 12, 15, 16.4	6, 8	1/144	1/144	240/60	15″	CT	☐	☐	☐	☐	Opt		☐	☐	☐	☐		
CENTRONICS 358	$5000	P&S	4K	10, 12 13.3, 15, 16.7	3, 4, 6, 8, 12	1/66	1/72	400/100	15″	CS	☐	☐	☐		☐		☐	☐	☐	☐	☐	Opt
C.ITOH 1550SC	$1679	P,S	2K	5, 6, 8.5, 10, 12, 17	6, 8	1/160	1/144	180	15.5″	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
C.ITOH 8510SC	$1299	P,S	2K	5, 6, 8.5, 10, 12, 17	6, 8	1/160	1/144	180	10″	CT	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
CP-1018	$1475	P,S	—	5, 6, 8 10, 12, 17	6, 8	1/120	1/120	90	15.5″	N/A	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	
DATAPRODUCTS P80	$2364	P,S	1.5K	10, 12, 16.8	6, 8	1/84	1/48	200/100	9.5″	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	Opt
DATAPRODUCTS P132	$2604	P,S	1.5K	10, 12, 16.8	6, 8	1/84	1/48	200/100	15″	CT	☐	☐	☐	☐			☐	☐	☐	☐	☐	Opt
FACIT 4544	$6702	S,P	2K	10, 12, 15	6, 8	—	—	225	18.7″	SP	☐	☐	☐	☐	Opt	☐	☐	☐	☐	☐		
TIP 302	$12,500	P&S		10, 13, 17	6	1/100	1/100	600/150	16″	SP	☐	☐				☐	☐	☐	☐	☐	☐	

NOTES:

1. Price including sales tax for base model without cable and options.

2. P = Centronics parallel; S = RS232C serial; first interface given is supplied as standard, others are options, generally at extra cost. Usually only one type of interface can be installed at a time, although several low-price systems include both parallel and serial interface as standard.

3. All printers have at least a single-line buffer, or two lines for near letter-quality mode. Figures given are for standard buffer size which may be optionally enlarged.

4. Character size as provided on manufacturers' specification sheets. Normally 10 char/in and 12 char/in are standard, with other sizes meaning compressed or enlarged print modes.

5. Switch selectable line spacing. Other spacings may be available under software control.

6. Minimum horizontal movement of print head in inches. Alternatively, may be a lesser default value for graphics mode.

7. Minimum vertical movement of print head in inches. Value is generally minimum line spacing, or may be a default value for graphics mode. Because any particular pin may be fired under software control, an effectively higher resolution is generally possible.

8. Printing speed for a single line at 10 char/in character size, and is not an accurate indication of throughput because of delays caused by slow paper slew, unidirectional printing, or logic delays. First value given is for draft mode where applicable. Second value is for best letter-quality mode where applicable. Not all printers have either or both modes.

9. Maximum paper width, not maximum size of print line. Print lines are generally restricted to either 8in or 13.2/13.6in. The maximum width for single-sheet paper varies from that for continuous paper.

10. SP = spool; CT = cartridge; CS = cassette. Spool ribbons are cheap, but usually difficult to instal. Cartridge ribbons (which fit around the print head, with the cartridge moving across the carriage with the print head) are more expensive but easier to instal. Cassette ribbons have a container that is attached to the printer case, and the ribbon functions in a manner similar to that of a spool. Cassettes are the most expensive ribbon types, but some manufacturers provide replacement ribbons.

11.-22. ☐ = standard; Opt = optional at extra cost.

11. Underlining may require the use of the lowest pin on the head for simultaneous underlining with the character printing, or may require a separate pass of the print head.

12. All printers seem to have this feature, but the quality of the implementation varies.

13. Normally, the lowest two pins are used to provide true descenders for characters such as "g" and "p", a feature not found on the earliest dot-matrix printers with fewer pins in the print head. It is a characteristic of most dot-matrix printers that true descenders look grotty, even in letter-quality modes.

14. Proportional printing provides varying widths for characters and spacing between characters, according to the shape of the character. In some printers, this mode is software-selectable, while others allow the creation of a downloadable character set that incorporates proportional printing features.

15. Some printers allow the user to create a different character set from that supplied, and this can be loaded into a special buffer in the printer. Some printers, such as the Epson FX, use the print buffer to hold downloadable character sets. Most printers have alternative character sets built in and available through software control. All printers examined have multiple international character sets.

16. Early dot-matrix printers used unimplemented ASCII character codes for special block graphics characters. This feature is maintained to allow quick-and-dirty graphics for some applications.

17. Most dot-matrix printers allow printing of high-resolution graphics, where the resolution is determined by the minimum horizontal dot spacing within a character and the minimum line feed increment, or through a special graphics mode which increases this resolution. With enough effort on the part of the programmer, almost any dot-matrix printer can be used to produce high-resolution graphics that are totally incompatible with any off-the-shelf software.

18. Lines are printed in both directions. Near letter-quality mode is slower because it usually requires two passes of the print head, normally only unidirectionally. Graphics are usually printed unidirectionally.

19. A smart printer will not travel all the way to the right of the carriage if the line is short, but some printer logic treats a short line as one padded with blanks that must be printed.

20. Tractor (or pin) feed is used for continuous paper, and is optional on many printers especially those marketed as letter-quality printers. A pull tractor pulls the paper from behind the print line, gripping the sheet after it has been printed on, resulting in wasted paper since the last sheet printed on is the one being gripped by the tractor mechanism. A push tractor pushes the paper ahead of it to the print head, and is usually built in.

21. Friction feed uses the usual typewriter platen arrangement to hold the paper, and is used for printing on single sheet paper such as letterheads. Very high-speed printers do not use friction feed.

22. Some dot-matrix printers designed primarily as letter-quality printers have an optional single sheet feeder.

* These printers have color as an option.

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OK, so you're looking for a dot matrix printer just to get from A to B. It must be economical and easy to drive, good looking but nothing a traffic cop will take a second look at.

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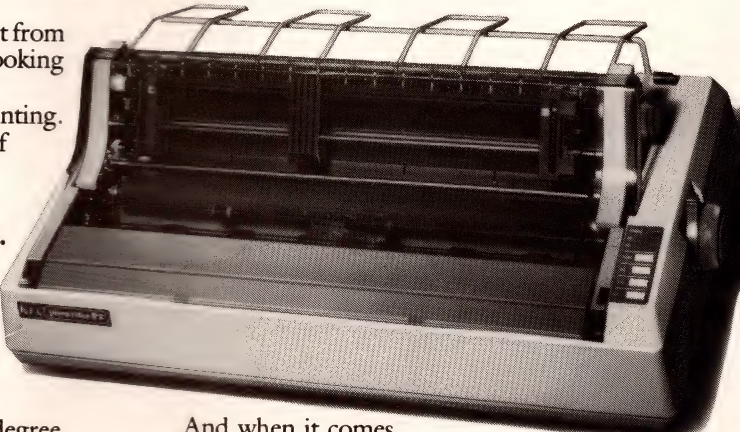

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NEC Information Systems Australia Pty. Ltd., 99 Nicholson Street, St. Leonards, N.S.W. 2065. Telephone: (02) 438 3544.

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(Inc. N.S.W.), 99 Nicholson Street, St. Leonards,
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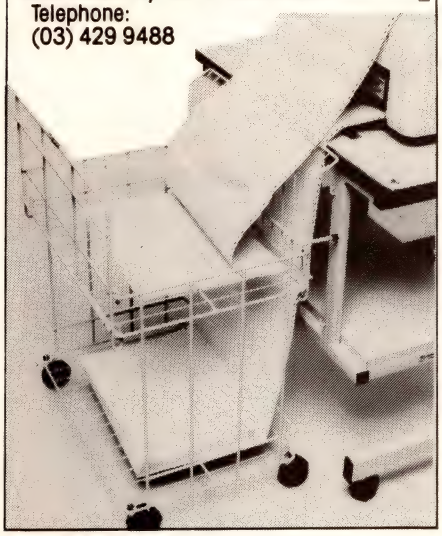

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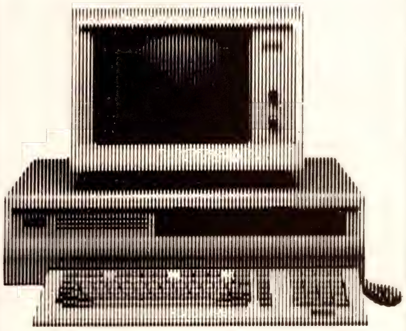

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From page 97

the quality of the typeface, and the ease of selection of fonts (from the front panel, and not requiring resetting the printer). The only critical fault is Nec's decision to emulate the IBM PC dot-matrix printer and not the daisywheel printer (or not to emulate both). While this decision did reduce the cost of the P2/P3, it made the printer incompatible with some word processing packages (WordStar 3.24 in particular). Variable line spacing and character spacing do not work under WordStar and the Pinwriter's proportional print mode conflicts with some WordStar features.

The quest for IBM PC printer compatibility produced another casualty; there is no italic character set. Although the IBM PC does not implement this character set, it still exists in the PC's printer, and has been installed by competing printers.

At about $1150 for the P2 and $1450 for the P3, the Pinwriters are bound to destroy the opposition from Epson and Star for medium speed dual-mode printers, leaving only the Anadex multi-mode high-speed printers and the Genicom 3404 offering an equivalent price/performance ratio (but at a much higher starting price).

Nec Information Systems,
99 Nicholson St,
St Leonards, NSW 2065.
Tel: (02) 438 3544.

NISSEI SANGYO WP-1000

According to Nissei Sangyo's engineer, this printer is an exact duplicate of the Copal SC-1000, except for the addition of the Nissei Sangyo name to the casing. At $546, you are paying a lot for the name change.

Nissei Sangyo Co Ltd,
200 Pacific Highway,
Crows Nest, NSW 2065.
Tel: (02) 923 1522.

OKI

The Oki Electric Industry Company of Japan manufactures a variety of dot-matrix printers suitable for microcomputer users. Two ranges are available in Australia: the wellknown Microline range and the high-speed Oki range.

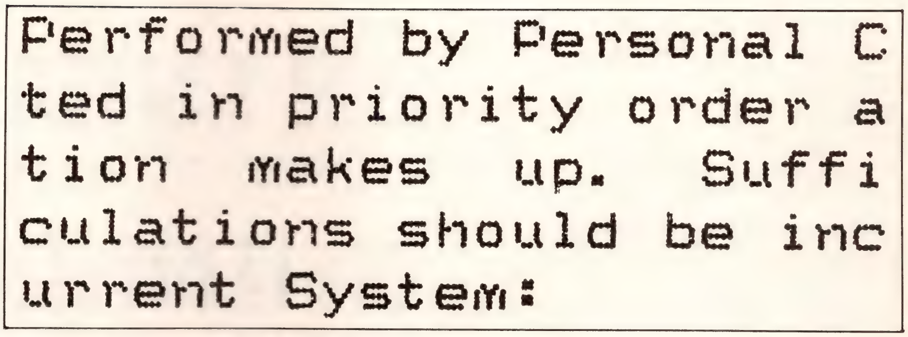
Like the C.Itoh offerings, the Oki printers are a solidly-constructed feature-packed tail-end implementation of the old concepts of dot-matrix technology. While not the most advanced printers, they are a reliable and safe choice for low-to-medium throughput.

After the Epson, the best-known printers are Microlines. An early choice for many microcomputer owners was the Microline 80, now no longer available. This 80-column printer could churn out reams of program listings without a pause, and it is a good guess that most of those sold are still in use.

The bottom-end Microlines now sold are the 82A and 83A models, with the only difference between the two models being the maximum print line length: 8in for the 82A and 13.6in for the 83A. Both have pull-tractors that can be removed for friction feeding, parallel and serial interfaces built in, bi-directional logic-seeking printing, block graphics, condensed and expanded print, and a print speed of 120 char/sec.

Because the 82A and 83A do not support a near letter-quality mode or high-resolution graphics, their manufacture has been discontinued, with the bottom-end Microlines now being the 92 and 93 models. But they are still available from a number of outlets, including Automation Statham in Sydney, for about $1200 and $1500 respectively.

The Microline 92 and 93 are the new workhorses for traditionalist microcomputer owners, being sold mainly through specialist computer dealers. The reason for this is that it requires considerable technical knowledge to interface a Microline 92 or 93 serially to many microcomputers.



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Microline 93 printout in draft mode.

The only difference between the 92 and 93 — like the 82A and 83A — is that the 93 can print a 13.6in line while the maximum line length of the 92 is 8in. Both have a DP print mode speed of 160 char/sec, with a throughput of around 120 char/sec. They also have a near letter-quality mode with proportional spacing of 40 char/sec which produces print that is quite acceptable.

Other features include high-resolution grahics (72 by 72 dots/in), downloadable character set, removable tractor feed, a 256 character print buffer on the parallel version (2K on the serial version), printing features such as superscripts, subscripts and underlining, as well as compressed and expanded print.

Both versions also have a mean time between failures of 4000 hours — I have not had one fail, and I have installed dozens — which is the best reliability claim of any similar dot-matrix printer.

But the Microline 92 and 93 do have two minor problems. FIrstly, they use a two-inch typewriter spool ribbon which is damn hard to install. Early 92s and 93s had a very complex ribbon guide system and, although this has been simplified in the current versions, changing a ribbon is a messy job.

Second, in order to allow interfacing with a wide variety of micros, Oki provided a serial board that could operate a dozen different protocols. Although the documentation for the 92 and 93 is detailed, with a separate manual for the optional serial interface, it still requires much trial and error to correctly strap the control lines to handle buffer overflow.

Unless you are certain of your technical support, avoid the serial version of the Microline 92 and 93, even though it means giving up the very handy 2K buffer. Other interfaces include serial current loop and IEEE-488 parallel.

The Microline 92 and 93 are very noisy printers, but an acoustic hood will muffle the sound so well that it is nearly impossible to hear the printers at all if they are so enclosed. Since the printers are equipped with both rear and bottom feed for continuous paper, an acoustic hood on a printer stand is an obvious accessory.

The Microline controls are simple: four controls for setting top of form, selecting/deselecting the printer, form feed and line feed, as well as rotary switch for setting form length. If you want to adjust any DIP switches, you have to remove the case.

You can expect to pay around $1100 for a Microline 92, and $1700 for a 93, with a serial interface costing around $250 extra, and a cable about $60 extra.

The top of the Microline range is the Microline 84, with a 13.6in print line, with Centronics parallel, low and high-speed serial, current loop serial or IEEE-488 parallel interfaces.

Printing speed in DP mode is a respectable 200 char/sec, with 50 char/sec in the proportionally spaced near letter-quality mode. All other features are the same as for the Microline 93, including the physical dimensions, except that the ribbon spool is three inches in diameter instead of two inches.

The rated printing speed of the Microline 84 is a good approximation of its actual throughput. Printing in DP mode, the 84 rocks and rolls, protesting at every line. But it will keep on printing at that high rate for hours on end, if you can stand the noise for as long as that.

A single sheet feeder is available for the Microline 84, but I have yet to hear of anyone selling one, let alone using one.

The documentation for the Microline 84 is good. Considering that it is not much different from the Microline 93, the 84's documentation is more detailed, giving more help to the user who wants to create a custom character set or use the various features of this printer.

At around $1800, plus $250 for a serial interface and $60 for a cable, the Microline 84 represents good value for money, better value than the Microline 93 when you consider the higher throughput.

The Oki 2350 and 2410 are similar in features to the Microline range, although they are much larger in size. The 2350 is the same as the 2410 except that it only has a DP print mode.

The 2410 has three print speeds: 350 char/sec in DP mode, 175 char/sec in draft mode, and 87 char/sec in correspondence mode. Maximum print line is 136 characters in 10 pitch, with two condensed fonts (12 char/in and 17 char/in) and three expanded fonts (5, 6 and 8.6 char/in), the same as for the Microline 92, 93 and 84.

Additional features include two-color printing (red and black), downloadable character sets, a 2K buffer, 144 by 144 dots/in graphics (72 by 72 for the Oki 2350), internal diagnostics, optional additional character sets (not on the Oki 2350), parallel and serial interfaces standard and an optional RS422 interface.

A single sheet feeder is available for the Oki 2410, but not for the 2350.

At $4660 and $5070 respectively, the Oki 2350 and 2410 (especially the latter) represent good value if high throughput is your need, although once again there is the worry of the reliability, especially when considering that the high speed is achieved using a single 9-wire head instead of a dual-bank shuttle head.

A number of distributors handle some or all of the Oki printers. Among them are:

Ampec,
114 Terry St,
Rozelle, NSW 2039.
Tel: (02) 818 1166.
Anderson Digital Equipment,
PO Box 422,
Clayton, Vic 3168.
Tel: (03) 544 3444.
Automation Statham Pty Ltd,
47 Birch St,
Bankstown, NSW 2200.
Tel: (02) 709 4144.

SAKATA SP-1000

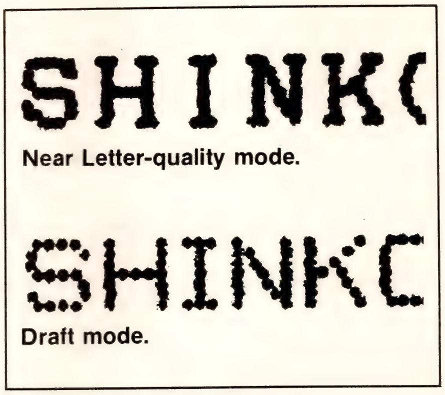
The SP-1000 is a rebranded Copal SC-1000, imported directly by Micro Buff and hence retailing for only $420. This may be the version of the SC-1000 that is manufactured under licence to Copal by Teco in Taiwan.

Micro Buff,
499 High St,
Mt Waverley, Vic 3149.
Tel: (03) 277 7754.

SHINKO S1310

You have to look carefully, but there are a fair number of Shinko printers in use. Possibly the only relevant one to microcomputer users is the S1310.

At $2394, the S1310 is more expensive than most dot-matrix printers. But for this price it offers some interesting features. The print speed is 250 char/sec (10-pitch), 300 char/sec (12-pitch), or 60 char/sec for near letter-quality (double pass). There is a proportional print feature, with no speed supplied, but it is better than 100 char/sec.


SHINK(
Near Letter-quality mode.
SHINKC
Draft mode.

Printing from Shinko S1310.

Both proportional and NLQ modes default to about 10 char/in, but there is no way of combining both. The command for either is cancelled by another print mode command. The S1310 will accept friction fed and continuous paper up to 15½in wide and has cutout switches for paper-out and cover-open conditions.

Other features of the S1310 include high-resolution graphics (240 by 144 dots/in), superscript and subscript printing modes, a 2K-byte buffer, block graphics, double-strike and underline, cassette ribbon system with replaceable ribbon,and a 7-bit/char code set for alternate characters. There is no downloadable character set facility.

The 56-page A4 size manual, while clearly written and illustrated, is still a bit sparse.

Only on two points did the S1310 cause problems: poor adjustment of the paper feed system put too much pressure on the continuous paper being used, causing it to jam occasionally; and the four screws that have to be removed to adjust the DIP switches inside the case have to be unscrewed from underneath the case, requiring some contortion if you do not want to damage the printer by resting it on its top.

Software Australia,
25 Somerfield St,
Mt Gravatt, Qld 4122.
Tel: (07) 348 4877.
Nissei Sangyo Co Ltd,
200 Pacific Highway,
Crows Nest, NSW 2065.
Tel: (02) 923 1522.

STAR

Thanks to competitive pricing and massive advertising by its distributor, Case Communications, the Star range of dot-matrix printers is probably the main competition for Epson's 55 per cent share of the local dot-matrix printer market.

Case distributes six Star impact dot-matrix printers: three models, each with a short or long carriage version. The low-end models are the Gemini-10X (8in print line) and Gemini-15X (13.6in print line). At $539 and $954 respectively (without cables), they match the Epson RX models in price at least, with the Gemini-10X being ahead of the Epson RX-80 with its built-in friction feed.

Both Geminis have a user-replaceable 9-wire head, a 120 char/sec print speed with bi-directional and logic seeking printing, 10-pitch, 12-

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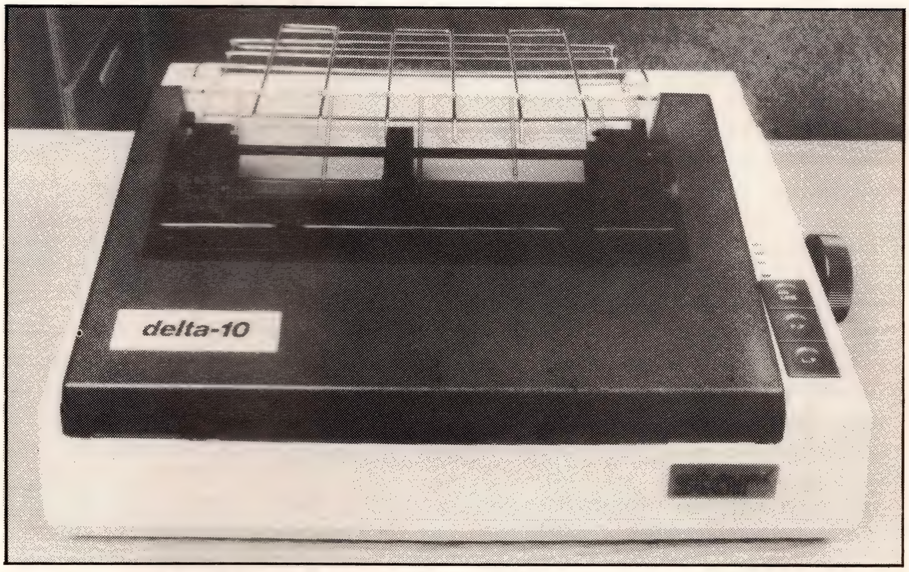


Star's Delta-10 multi-mode Epson lookalike.

pitch and 17-pitch character sizes (with double width versions of each size), high resolution graphics, and word processing features including an italic character set as well as superscripts and subscripts (but no near letter-quality mode). The Geminis will accept single sheet, continuous or roll paper, and have block graphics, foreign character sets, and the ability to receive downloaded character sets.

Maximum width of paper accepted is 10in for the 10X and 15in for the 15X, and the ribbon is an Underwood spool type. A parallel interface is standard, with an optional serial interface and optional 4K-byte or 8K-byte buffer.

The printing quality is high, with true descenders and well-constructed characters. While the dot structure of the characters is obvious, especially in expanded mode, they are quite readable.

There are only three controls: select, line feed, and form feed. The DIP switches for setup are easily accessed through a small hole in the back of the printer, although changing the switches on the serial board requires the removal of the case.

Since it began its American operation, Star has commissioned a new user's manual to replace the old barebones manual we have come to love to hate. More than 200 pages long, spiral bound, it provides detailed descriptions of the printer's operation and interfacing, as well as many examples of how to use the printer's functions. The manual does give the game away, though; its examples are primarily for the IBM PC.

The Delta-10X and 15X are upmarket versions of the Gemini models, with only a few changes. Print speed has been increased to 160 char/sec (with a 240 char/sec white spacing speed), an 8K-byte buffer is included as standard, both serial and parallel ports are standard, and continuous paper can be fed from either the bottom or the back.

For these extra features, the prices of the Delta-10X and 15X are $954 and $1434 respectively (without cables), once again much better than a similar Espon except for the absence of proportional printing.

In spite of its multitudinous features, I was not overly impressed with the Delta-10X. In spite of the high printing speed claimed, throughput was slow, mainly due to a low paper slew rate (1.6 in/sec). Ribbon insertion is tricky, and the ribbon-feed mechanism allows too much slack in the ribbon.

Other minor but annoying problems included the uncomfortably-pitched noise — a fault it shares with the Epson — and an acoustic cover that is too dark to see through. When the cover is lifted, it comes off instead of being hinged and, although it gives the user clear access to the guts of the printer, it is messy. Generally, the quality of finish and the features put the Star Delta a little below the Epson FX, but well above the Epson RX.

The excellent manual forgives all sins; more than 300 pages, with a wealth of detail, including how to use the Delta with the major microcomputers (including how to use the Commodores, TRS-80s, Apple *//*s, and the Atari 400/800) and major micro word processing packages.

The top of the Star range are the two Radix models. The print speed has been increased to 200 char/sec, a near letter-quality mode has been added as well as a proportional printing mode, and international character sets can be downloaded. Both Radix models have both serial and parallel interfaces as standard.

Other new features include semi-automatic single sheet feed, pause and feed control, and reverse paper feed.

For these extra features, the prices have also increased. The Radix-10 is $1536, and the Radix-15 is $1860, without cables.

In pricing and features, the Radix printers compare favorably with the Epson LQ-1500, but still seem placed below the LQ-1500 in the market. Because the Radix models use only a single 9-pin print head (for an 18 by 9-dot matrix in NLQ mode), while the LQ-1500 uses a 24-pin head (for a 17 by 24 matrix in a letter-quality mode that may be more than NLQ), the Epson should produce a better quality print. As well, the Radix specification sheet distinguishes between proportional and NLQ modes, which makes me feel that the user must make a choice between the two modes.

Generally, the Star dot-matrix printer range seems a favorable alternative to the Epson range, in features and pricing, although in some respects a little down market.

Case Communication Systems Ltd,
1-3 Rodborough Road,
Frenchs Forest, NSW 2086.
Tel: (02) 452 5231.

TANDY TRS-80

Tandy Australia distributes a large range of TRS-80 dot-matrix printers.

All TRS-80 dot-matrix printers except the DMP-2100 include a serial port for interfacing to the Tandy color computer. But surprisingly, none of the Tandy dot-matrix printers support a downloadable character set.

The bottom of the printer range is the DMP-110, priced at $499. It prints at 50 char/sec, with a maximum print line of 8in. It supports printing at 10, 12 and 16.7 char/in, as well as an expanded mode for each character spacing, plus a near letter-quality mode (at 25 char/sec). Graphics (60 by 120 dots/in) is supported.

While the manual is written in a clear, helpful style, it expects the user will attach the printer to only a TRS-80 computer, so no interfacing information is given.

The DMP-200, priced at $899, prints at 80 char/sec in draft mode, 45 char/sec in near letter-quality mode. Character spacing is 10, 12 and 16.7 char/in, with no expanded mode.

Maximum line length is 8in. Other features include built-in tractor and friction feed, proportional printing, bit-image graphics, and a 2K-byte buffer.

The DMP-420 is a big advance on the DMP-200. It is designed to reduce noise during operation, making it more suitable for office use. Its 9-pin print head prints bidirectionally with logic seeking at the rate of 140 char/sec in draft mode, and 84 char/sec in near letter-quality mode.

Other features include bit-image graphics (60 by 200 dots/in), wide carriage, tractor and friction feed, three font sizes (10, 12 and 16.7 char/in) plus expanded modes in all font sizes, proportional printing, and a 2K-byte buffer.

The DMP-500 is the fastest dot-matrix printer Tandy sells. Its speed in draft mode is 220 char/sec (131 in near letter-quality mode). Character sizes match the other DMP models.

Other features include tractor and friction feed, wide carriage, bit-image graphics (60 by 200 dot/in), and proportional printing. At $1999, it compares favorably with the Epson FX-100 and the Star Delta.

The top of Tandy's dot-matrix printer range is the DMP-2100, priced at $2699. It seems to be a modified version of the Toshiba P1350.

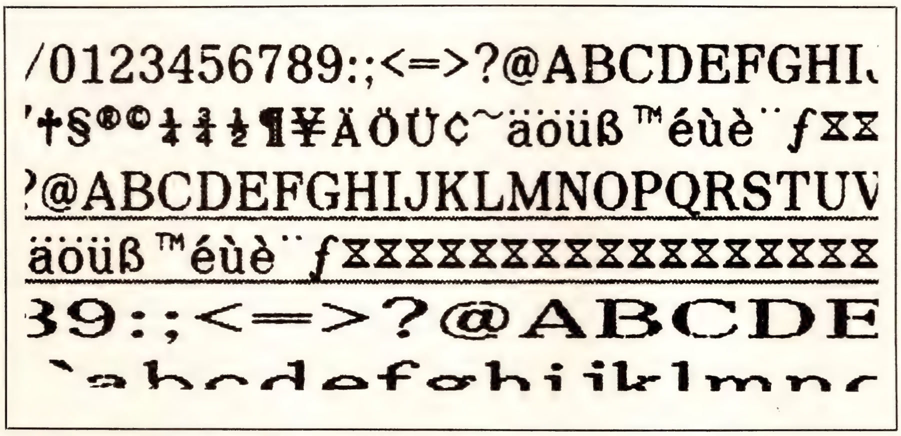
This printer has a speed of 160 char/sec in draft mode and 100 char/sec in near letter-quality mode. The built-in font styles are impressive: standard in 10 and 12 pitch, correspondence in 10 and 12 pitch, condensed in 16.7 pitch, proportional, and block graphics. All font styles can be expanded to double width, or printed in bold.

The proportional and correspondence styles are as good as most typewriters, thanks to the 24-pin print head, and it is virtually impossible to see the dot structure.

Other DMP-2100 features include bit-image graphics (180 by 120 dots/in), optional tractor feed and automatic sheet feeder, wide carriage ribbon. The printer is quiet and fast, and paper is easy to load.

It is a mistake to assume that TRS-80 printers are only suitable for attaching to TRS-80 microcomputers. The standard Centronics parallel interface means that these printers can be used with most micros, while Tandy's extensive service and support network is a good guarantee of continued satisfaction.

Tandy Australia Ltd,
91 Kurrajong Ave,
Mt Druitt, NSW 2770.
Tel: (02) 675 1222.



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Letter quality print from Tandy's DMP-2100.

TI 850/TI 855

Texas Instruments manufactures a number of dot-matrix printers in its Omni 800 range which can be interfaced with most microcomputers. The two latest entrants are the TI 850 and the TI 855.

The TI 850 is a small printer (maximum paper width of 11in with a speed of 150 char/sec in draft mode and 90 char/sec in enhanced mode (not quite near letter-quality, but close). It has all the word processing features expected of second-level printers (including superscripts and subscripts), as well as high-resolution graphics, block graphics, tractor and friction feed, serial and parallel interfaces as standard and a cassette ribbon system.

At $1065, the TI 850 is competitively priced with the Epson and Star ranges.

The TI 855 is probably the most exciting dot-matrix printer introduced in the past year. The 150 char/sec draft mode speed is nothing exceptional, but the 35 char/sec letter-quality mode is, as it incorporates enhanced printing with a choice of three different character fonts, including a proportional font.

The front of the printer has three sockets in which different font modules can be installed (similar to

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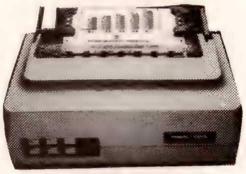

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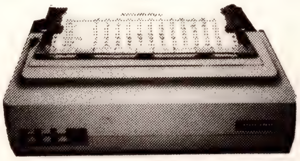

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the Toshiba P1350 fontpack). The font styles effect both draft and letter-quality mode, and the font style used can be changed from the control panel or through software.

The TI 855 also has all the word processing features needed to emulate the Qume/Diablo and Epson printers — serial and parallel interfaces as standard, friction and tractor feed, high resolution and block graphics, cassette ribbon system and a 256-byte buffer.

The TI 855 is a little too noisy for comfortable operation in offices. It also has a habit of defaulting to near letter-quality printing at 10 char/in spacing when it starts printing a document, and even though you can immediately change the mode without interrupting the printing, it is still a problem when all you want is a fast draft.

The documentation is clearly written and illustrated, although more details would always be welcome. The printer is easy to set up and use.

At $1465, it offers better value for money than the Toshiba P1340. Its higher price compared with the Nec P2 Pinwriter (about $200) may be a good trade-off if you need several different type faces and are unwilling to design your own.

Texas Instruments,
6-10 Talavera Rd,
Nth Ryde, NSW 2113.
Tel: (02) 887 1122
Magraths Electronics
55 A'Beckett St,
Melbourne 3000.
Tel: (03) 347 1122.

TOSHIBA P1350/1351/1340

The Toshiba P1350 was the first dot-matrix printer to bring high speed multi-mode and multi-font printing together in one machine at a price that was lower than the microcomputer with which it was to be interfaced. At $2830, it still presents a reasonable price/performance ratio if you need its major feature: different type faces instead of different sizes or print qualities of the same face.

Standard features of the P1350 are a wide carriage, parallel and serial interfaces, friction feed (optional tractor feed and single sheet feed), high-resolution graphics, a fast draft printing speed of about 160 char/sec in 10-pitch and a proportional letter-quality speed of about 100 char/sec 10-pitch or 12-pitch, and a 24-pin print head.

The P1350 specification sheet claims four fonts. It actually has two type faces (10 char/in and 12 char/in) in letter-quality and draft modes. An Australian modification allows these fonts to be changed using a replaceable "fontpack", although switching between installed fonts is still done under software control or by changing DIP switches inside the front of the case.

The print is high quality, although the claimed speed at letter-quality printing seems higher than close examination would suppport. The noise level is low, but still loud enough to be annoying.

For those users wanting to replace a Qume daisywheel, an optional Qume instruction set is available. Another attractive option is the sheet feeder. Although expensive, it is one of the few that will work properly every time.

The P1350's controls are simple: a test switch, select/deselect, paper feed, and a top of form switch. For some reason, the top of form switch advances the paper by one full form and not simply to the next top of form. This can be annoying if you are listing a program or using a word processing package that does not automatically give a form feed at the end of the last page.

Although the P1350 was a trail-blazing dot-matrix printer, nearly all of its features are available on cheaper printers such as the Nec Pinwriter. Its only advantage is the option of changing character typefaces (where one face is not italic) or installing different typefaces.

The Toshiba P1351 is similar to the P1350 except that it is more expensive ($3370) and incorporates a 16K-byte buffer for up to four downloadable character fonts. Character font libraries are available on disks to suit most microcomputer formats.

The P1340, smaller version of the P1350, has a maximum paper width of 10in, print speeds of 93 and 54 char/sec for draft and letter-quality printing respectively and no optional sheet feeder. The P1340 has the same as the P1350 except there is no font pack.

The present recommended price of $1675, while putting it ahead of the Epson and Star printers in the price/performance ratio, still leaves it lagging the Pinwriter.

Toshiba (Australia) Pty Ltd,
82-94 Talavera Rd,
North Ryde, NSW 2113.
Tel: (02) 887 7322.

TRILOG TIP-300/302

A 600 char/sec speed puts an incredible strain on a dot-matrix print mechanism, reducing the reliability of such printers especially in high duty cycle conditions. The TIP-300, manufactured by Trilog, halves this strain by using a shuttle head with two banks of 22 pins, and in draft mode prints three characters simultaneously.

Although not cheap at $12,200, the TIP 300 features 600 char/sec draft mode and 150 char/sec NLQ mode (a 16 by 16 dot matrix), twin Z80 microprocessors handling I/O and print control, high-resolution graphics, parallel and serial interfaces standard, tractor feed only, two character sets with a further two optional, and built-in diagnostic routines.

The Trilog TIP-302 is similar to the TIP-300 except that, for $12,500, it adds multi-color printing using a three-color ribbon.

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Personal computers have found extensive application as real time control and data-collection systems in scientific laboratories.
Bob Dalglish explains the theory and practice of using computers as experiment control systems

EXPERIMENTA CONTROL

THE present generation of personal microcomputers is eminently suited to real-time control and data-collection systems. The low cost of these computers, combined with the powerful but cheap standard peripherals available for them, allows quick and easy development of powerful real-time systems. This in turn opens up an extensive area of control and instrumentation applications to microcomputer-based solutions.

Control systems are used in almost every area of technology. They are used to monitor the behavior of a specific process, to determine what changes are needed to maintain that process in some

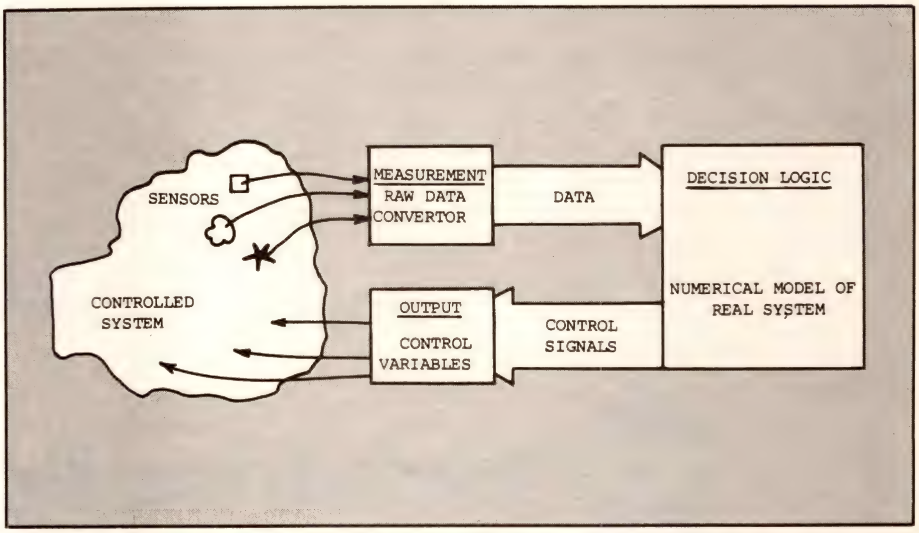

Figure 1: Computer-aided control system.

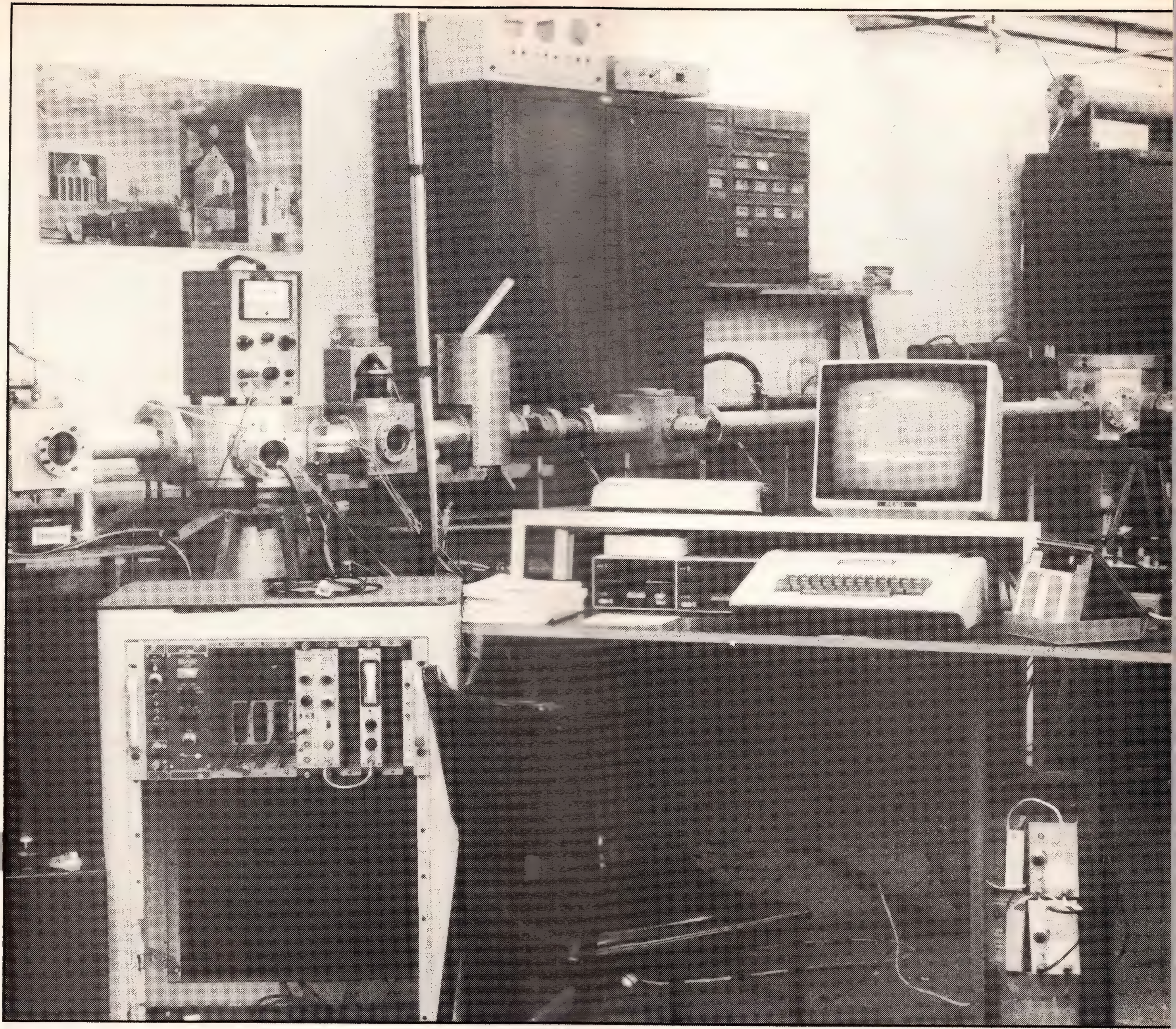

Figure 2: Experiment setup using an Apple // computer to test a lens designed to focus ions.

desired state and to carry out the necessary adjustments to keep the process in that state. Such a control system can thus be divided into three parts (see figure 1): a measurement section, which connects directly to the real system, makes readings of system parameters and converts these into a suitable data format for transfer to the rest of the control system; a decision-making section which uses built-in logic or "intelligence" of some sort to evaluate the input data and to decide on appropriate responses; and an output section which converts the signals from the decision-making section into direct-process control parameters to modify the operation of the system.

A simple example of such a control system is the "governor" fitted to early steam engines. This device sensed the speed of the engine shaft and adjusted the steam inlet valve setting to keep the speed essentially constant over a wide range of engine loads.

As technology expanded, the need for more elaborate control systems led to the introduction of digital electro-mechanical control systems using large arrays of electrical relays. Telephone systems and elevator control systems designed before about 1960 are sophisticated examples of these. A major problem with such systems was the need to design virtually all of the hardware from scratch for every new system.

Following the development of the general-purpose computer in about the mid-1950s, it was realised that the tedium and cost of designing control systems could be cut dramatically by using a general-purpose logic machine (a computer) as the decision-making module of the system, to provide it with the necessary input and output connections, and to then program the computer with the intelligence needed to execute control. The high cost of early computers limited this approach to large applications such as chemical plants, but as soon as it was possible to cram all the circuitry needed for a functional programmable controller on to a few semiconductor chips, the engineering world adopted this microprocessor system philosophy even for such mundane devices as washing machines.

It was soon realised that these cheap microprocessors could operate a small computer, and the microcomputer revolution began. The microcomputer industry's preoccupation with software development has generally overlooked an important application area. These comparatively simple and economical computers, available with a wide range of good, low-cost peripherals and software, can easily and efficiently be applied as the control module of versatile, cheap and powerful real-time control or data-collection systems.

Exploitation of this application of a microcomputer is limited at present to those who understand microcomputer hardware and who are able to build the input and output interface modules needed. A good range of such modules is only available for more expensive industrial microprocessor development systems.

One area in which the use of personal microcomputers for data collection and control has been developed extensively is scientific research. In this work it is often necessary to build a specific data-collection system quickly and at minimal cost, and later to rearrange it as a different instrument for another task. This requires a modular approach to both system hardware and software items. In particular, it requires the standardised modules — to connect with the expected range of input sensors or output controllers — be designed and kept on hand.

This modular approach is also ideally suited to quick and efficient development of microcomputer real-time control systems from a small range of standard, proven hardware and software modules. To demonstrate this principle, I will briefly describe three interface modules we have developed for our experimental work. I will then outline some applications which use them.

When this development began in about 1979, the Apple *//* was the most friendly and best-documented microcomputer available for this work. Most of our development has, therefore, been on this machine, although many machines now available are also very suitable

Our most frequent interface requirement is for simple digital and analogue I/O. A simple digital input allows outside logic levels or sensing switches to be read by the software, while simple digital outputs are easily connected to relays, thyristors, and so on, for on/off controls. Analogue inputs and outputs are usually needed to monitor or control continuous outside variables.

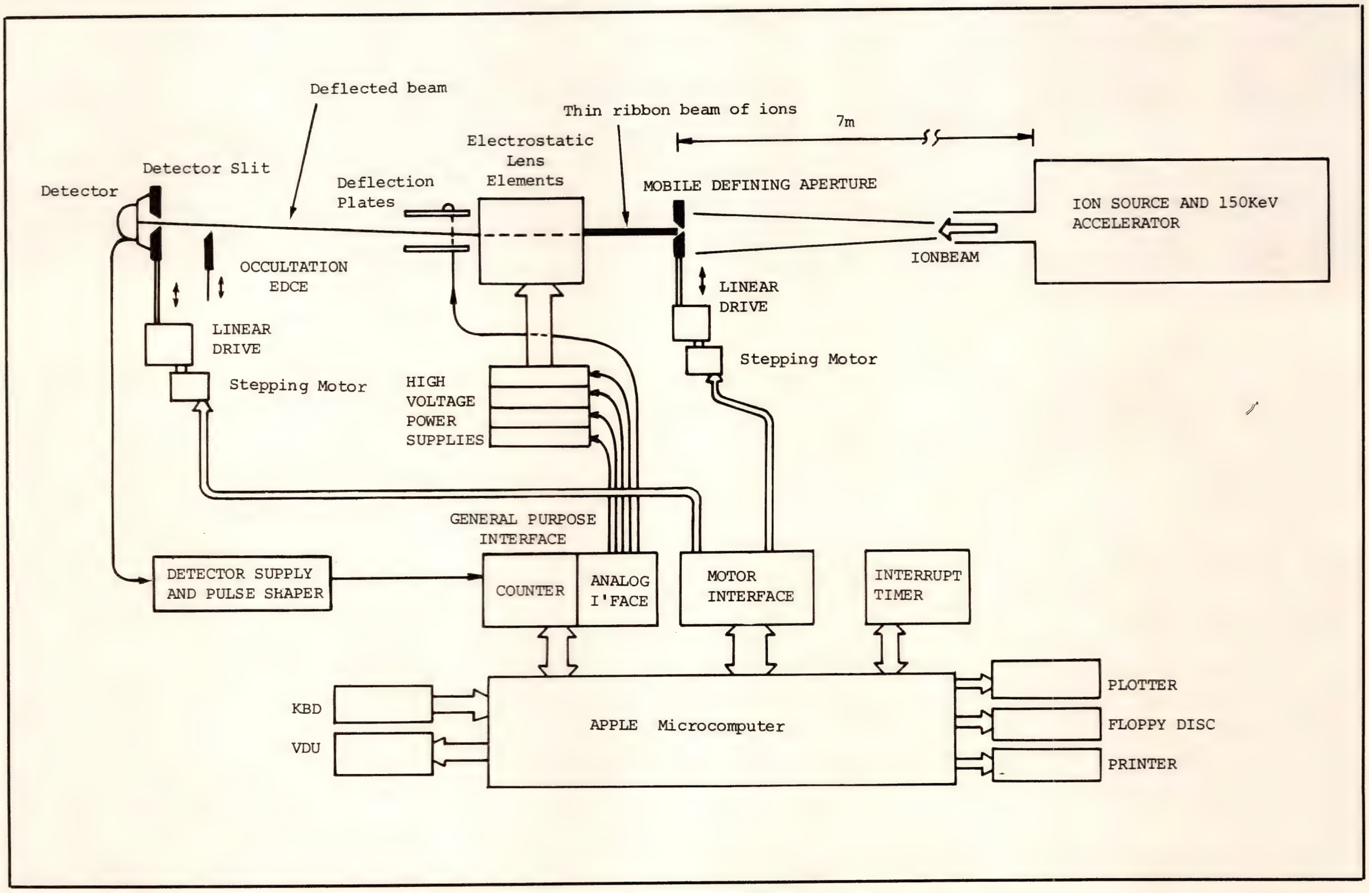

Figure 3: Diagram of the experimental setup.

The first interface we needed was actually a general-purpose module with multi-word digital and analogue I/O and a versatile 16-bit timer/counter. (There are now about 30 of these working in our university.)

Stepper motors are used a lot in research for positioning shafts, detectors and so on. We therefore made a standardised control module to drive all our commonly used stepper motors. This module controls two motors and accepts a single command to move either motor backwards or forwards from one to 127 steps.

A simple timing module was made to generate software timed and controlled interrupts. As explained below, this allows data collection and analysis to continue concurrently.

We are now researching and developing a new type of "lens" system for focussing ion and electron beams. This new lens is unconventional and is not easily analysed by conventional lens theory. Our first efforts in this new field therefore relied heavily on experimental measurements.

To assess the operation of the lens it was necessary to pass thin rays of ions through it and to measure the deflection of these rays as a function of their input positions and the deflection voltage applied to the lens. Figure 2 shows the experimental setup used for these measurements.

The use of a microcomputer data collection system yields several significant advantages. Apart from the obvious ease of programming the system, the standard computer peripherals such as disk storage, VDU with graphic data display capability, keyboard interaction, output printers and graph dumps all become available to the data collection system at no cost or effort. Using the three modules described above, it was possible to expand the microcomputer quickly into a programmed data-collection and control system.

The control program is in two major sections: background data collection and processing/analysis. The data-collection section requires the stepper motor controlling the defining slit (see figure 3) to be put first into a pre-determined position. The detector slit is then moved across the deflected beam by small predetermined amounts at regular intervals. During each interval, the number of ions hitting the detector is counted and tallied into successive elements of a one-dimension data array. At the end of the detector traversal, the array holds data about the intensity profile of the deflected beam as a function of position. The program can then adjust the experiment parameters, such as defining slit position, and perform the next traverse automatically.

The core of this process, the control of the detector stepper motor and the collection of the intensity data array, is all done as an interrupt service routine initiated by the programmable interrupt timer. The main program can program the timer and enable or disable it to control the data collection process.

The other section of the program runs in "foreground", essentially independent of the "background" interrupt-driven data collection routine. Thus, the foreground section gives the operator continuous access to supervise and control the process. To simplify the control program development, the back-

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ground interrupt routine overlaps the data array on to a normal integer array in Applesoft Basic.

This allows quickly written and easily modified Basic programs to monitor and display the incoming data and to decide the changes needed in experimental settings for the next run. The foreground section continuously displays and updates the incoming data using fast machine language routines and monitors the keyboard to respond to operator commands.

The data collected from this setup gave us considerable insight into the behavior of the lens. We then wrote software to trace mathematically the path of the ions in the lens and decided we needed accurate maps of the electrostatic field in the lens. These could not be calculated accurately, so we built a small electrolytic tank and extended the microcomputer system to automatically collect a three-dimensional array of the lens potentials found in the lens modelled in the tank.

For this extension, it was only necessary to build a simple motor control system using the existing digital interface and a simple RMS to DC pre-amplifier to communicate with the existing A/D input (see figure 3). Software was quickly written to collect the data array and to process it into a form suitable for the ray tracing program. With this setup we could quickly explore the beam-focussing performance of many lens geometries without long, time-consuming experiment runs on the main system.

At the same time, we have modified the original setup to allow very high resolution profiling of the focussed ion beams we now make. This facility is included by adding deflection plates just after the lens. These plates are simply connected to the analogue voltage output from the standard interface.

Revised software now stops the detector motor after it has located the beam, then generates a new data array of the profile by deflecting the beam electrostatically. This is done in small steps back across the detector slit, thus generating a high-resolution profile as the beam "appears" over the detector slit "horizon". (This is the standard occultation technique used in astronomy.)

Rather than continue here by describing other similar experimental setups, I would like to generalise on this type of approach to data collection and control applications. This will allow a short discussion of the limitations to this approach and some techniques to overcome them.

The applications described above fit comfortably into the capabilities of an 8-bit personal microcomputer, as none of these machines requires a large memory space or very fast response. To use the attractive foreground/background software technique discussed, the present small personal machines are restricted to a background (interrupt) response time of about 20m/secs and an interrupt service time of no less than about 100m/secs. This can be reduced considerably by dedicating the processor to the external task.

Furthermore, allowing for program and graphic display memory usage, the available 64K-byte memory space is fairly cramped. These two limitations of speed and space can be circumvented by a restructuring of the computer/interface architecture. The speed limitation can be overcome by using direct memory access (DMA) interface hardware which temporarily disables the processor to transfer data between the interface hardware and memory as fast as the memory can handle it. Obviously, this requires more sophisticated

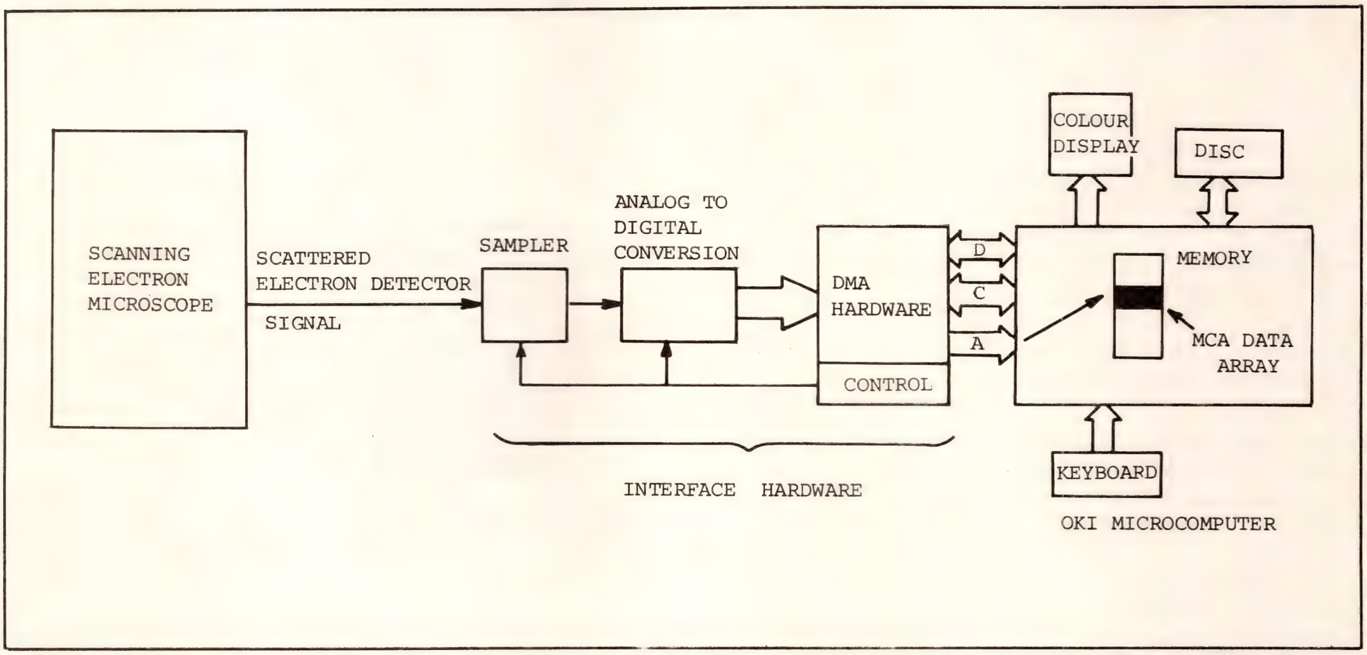

Figure 4.

electronics than that needed for the simple interfaces described above.

The speed problem arises in all high-speed data collection systems, for example, pulse height analysers (PHA). A brief outline of two systems recently built for this task will demonstrate the principles. In a PHA system, the input data is in the form of a string of short voltage pulses of varying heights. Whenever a pulse whose height is between predetermined upper and lower levels is input, the system has to convert the pulse height to a digital value and then to increment a counter (channel) assigned to that value.

The overall effect of this process is to generate a histogram of pulse heights in the memory of channel array. Such a system is commonly called a multi-channel analyser (MCA). It is possible to carry out such a process under program control in a computer, but the shortest achievable cycle time with efficient machine code and processor dedication is of the order of 100m/secs and the maximum data rate is limited to about 10KHz.

This PHA or MCA process is, however, ideally suited to DMA access, as the interface can directly access the memory location assigned to each pulse's "channel", read the data, increment it and restore the new value in two memory cycles (for a one-byte count). This increases the input data processing rate to almost 500KHz.

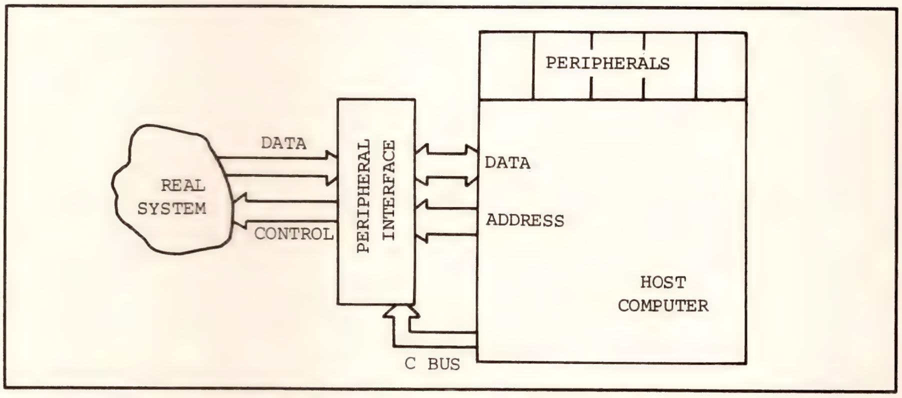

Figure 5.

In one example of such a system (figure 4), the requirement was to generate an MCA data array by repeated sampling of the continuously varying signal coming from an electron detector in a scanning electron microscope. In the instrument used, the signal intensity is proportional to the average atomic number of the sample surface under the beam. As the beam scans the surface, the MCA array thus indicates the proportions of all the different compounds on the surface.

In this application, virtually all the processor time was needed to service a complicated and detailed color display. By using a DMA technique, the interface needed only 2 per cent of the computer time; with conventional access, the interface would have needed more than 50 per cent of the processor time.

The next example involved a system to collect PHA data from four separate X-ray cameras. Signals from each of these one-dimension cameras arrive as a string of pulses; the height of each pulse indicates the position where an X-ray photon has hit one of the cameras. The resultant PHA arrays thus give information about the spatial

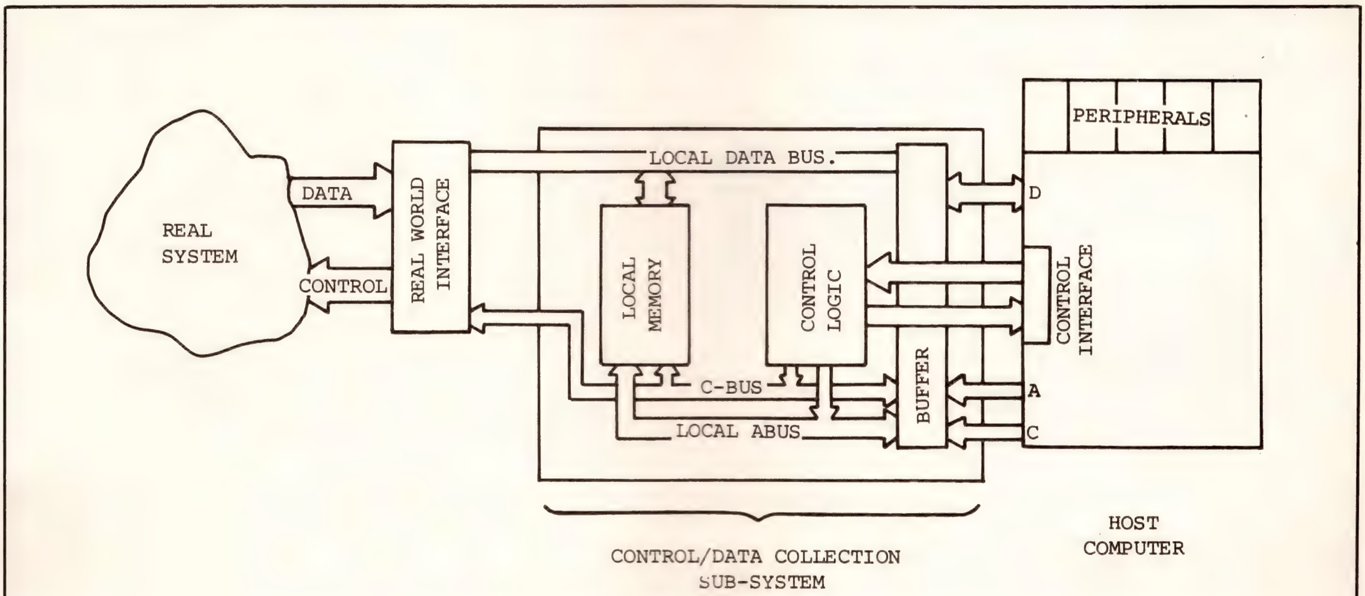

Figure 6.

intensity of the X-rays on each of the four cameras.

The problem here was that each camera could independently deliver pulses at rates up to 100KHz. (Thus, pulses from each camera could overlap.) The solution adopted was to build four independent pulse converter modules which, after detecting and converting a pulse to a channel address, requested service through a single DMA controller module.

The controller was responsible for queueing coincident requests and carrying out the DMA cycles in an orderly manner into each camera's multi-channel array. Thus, the resultant system was able to achieve data rates up to almost 500KHz (at which rate the processor was completely blocked off the bus!).

This last remark (in brackets) brings us to the last subject to be discussed here. DMA techniques obviously can help, but they are not the final solution for high-speed systems, and they don't help to expand the addressable memory space.

There is a more elegant, but inevitably more complicated, solution I have been developing to cope with the difficult applications that always seem to turn up after you have learned how to handle the simple ones.

To explain this new technique, let me abstract the structure of the interfaces and instruments I have been discussing. Figures 5 and 6 show the overall architecture. The important feature is that the control/data collection module is a peripheral of the host computer.

In this new technique, the architecture is turned inside out and the interface becomes a self-contained, bus-oriented, hard-wired data collection or control subsystem to which the host computer now becomes a peripheral! This allows the external system to be designed to operate at whatever speed is necessary to have whatever data-word size or address range is needed to suit the application. The computer is then interfaced to control and monitor this external instrument through conventional I/O ports (allowing full operator or host program control), and to transfer data to or from the external memory array via a buffer which converts the word size and address range of the external memory into a form suitable for access by the host computer.

With a little care, this memory buffer can be arranged to be totally transparent to both the host and external system.

Bob Dalglish is senior project scientist in the School of Physics at the University of NSW.

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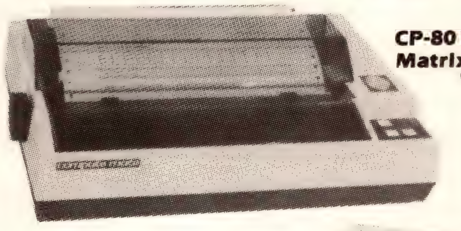
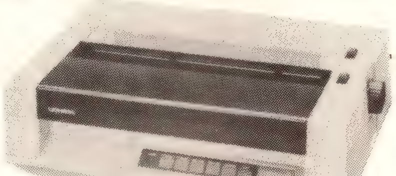


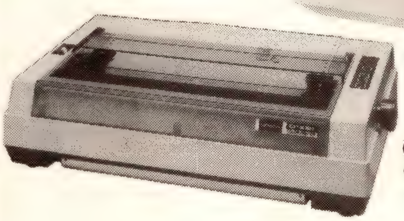
CP-80 Dot Matrix Printer

Character size	2.1 mm W x 2.4 mm H/7 x 8 dot matrix
Printing speed	80 CPS, 640 dots
Printing direction	Bi-directional, logic seeking
Columns/line	Normal size — 80 columns Double width — 40 columns Compressed — 142 columns
Paper feed	adjustable sprocket feed and friction feed
Paper type	Fanfold. Single sheet
Paper width	101.6 mm to 254 mm
Number of copies	Original plus 3 copies normal thickness paper
Interface	Standard centronics parallel Optional RS-232C



DWX-305 Daisy Wheel Printer

Printing system	96 spoke daisy wheel (QUME WP compatible)
Printing speed	80 CPS, 640 dots
Printing direction	Bi-directional, logic seeking
Columns/line	Normal size — 80 columns Double width — 40 columns Compressed — 142 columns
Paper feed	Adjustable sprocket and friction feed
Paper type	Fanfold. Single sheet
Paper width	101.6 mm to 254 mm
Number of copies	Original plus 3 copies normal thickness paper
Interface	Standard centronics parallel Optional RS-232C



CP-1018 Colour Printer

Printing method	Impact dot matrix	
Number of dot wires	18 dots (9 x 2); 0.25 mm dia	
Inking	Ink pad platen method	
Ink colours	7 colours: Black, Violet, Blue, Green, Red Aqua and Yellow.	
Fonts	HD/HS PICA ELITE CONDENSED	(10 characters per inch) (12 characters per inch) (17.14 characters per inch)
Printing speed	Condensed	154 cps
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Paper feeding method	Pin fold and friction feed	
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ARC 02

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Data 84 has been Australia's leading small business show. This year confirmed the trend away from applications to the computer that has emerged in recent years.
Ian Webster considers whether the Data shows can survive the microcomputer

DATA 84

DATA shows over the past few years have reflected the efforts of the local computer industry to come to terms with the elusive moving target of the business market for small computers. Several years ago, a Data show was a quiet oasis of minicomputer suppliers and value-added dealers, with data-entry operators demonstrating applications software.

Rudi Hoess was the first to disturb the calm with the magnetic micro — an Apple — changing the focus of these shows from the application to the computer itself.

Last year, the show seemed to have settled on a useful direction with an extensive display of multi-user micro systems. This year, the show was expected to reflect a mature mix of multi-user solutions and powerful microcomputers. It didn't. With hardly a multi-user system in sight, it could best be described as AFTER PC.

The show organisers managed to squeeze 103 exhibitors into Centrepoint, using small stands and an endless corridor that wound past every stand and back again. While the layout provoked mixed response from exhibitors and visitors alike, it did little for the atmosphere of the show.

Despite first impressions, the show was well attended by suppliers. All major distributors, except Tandy and Barson Computers were there. Dealers gave strong support, and the usual contingent of office supplies companies and the trade publications attended.

There is obviously a lot of enthusiasm for the small business market.

Nearly every equipment supplier was displaying a PC-compatible computer. The most interesting of the new machines on display were the Plessey PC, a dual 3½in drive system from the UK, Pace Computers' Monroe 2000 and two Asian computers, the Fox 2001 from President and the Emtek PC from Emtek.

Computerland showed the popular Compaq portable for the first time since becoming distributor for the system in Australia. IBM showed every mainframe's dream micro, the 3270-PC, and released a new series of brochures that indicate its intentions to move into the schools computing market.

The two first portable computers showed the strength of this part of the market. President and Osborne Sales Centre had busy stands, with President releasing an LCD portable, with ROM disk software, called the Roadrunner, and Osborne displaying the enthusiasm and commitment that keeps the Executive selling well.

Automation Statham is also doing well with the new range of Morrow hard disk systems that show that 8-bit computing still offers a lot of value for money.

Dulmont, now breaking into the international market, AED and the Portable Computer Co are the only Australian manufacturers who see these shows as worthwhile. They were joined by a new company, Synax Systems, that manufactures a shared bus multiprocessor system using Z80 and 80186 processors running under TurboDOS.

As well as the legion of office supplies companies that are always part of a Data show, a few veteran exhibitors such as Daro, MDS Quantel, Wordplex and Emulex were reminders of how much this market has changed in a few years.

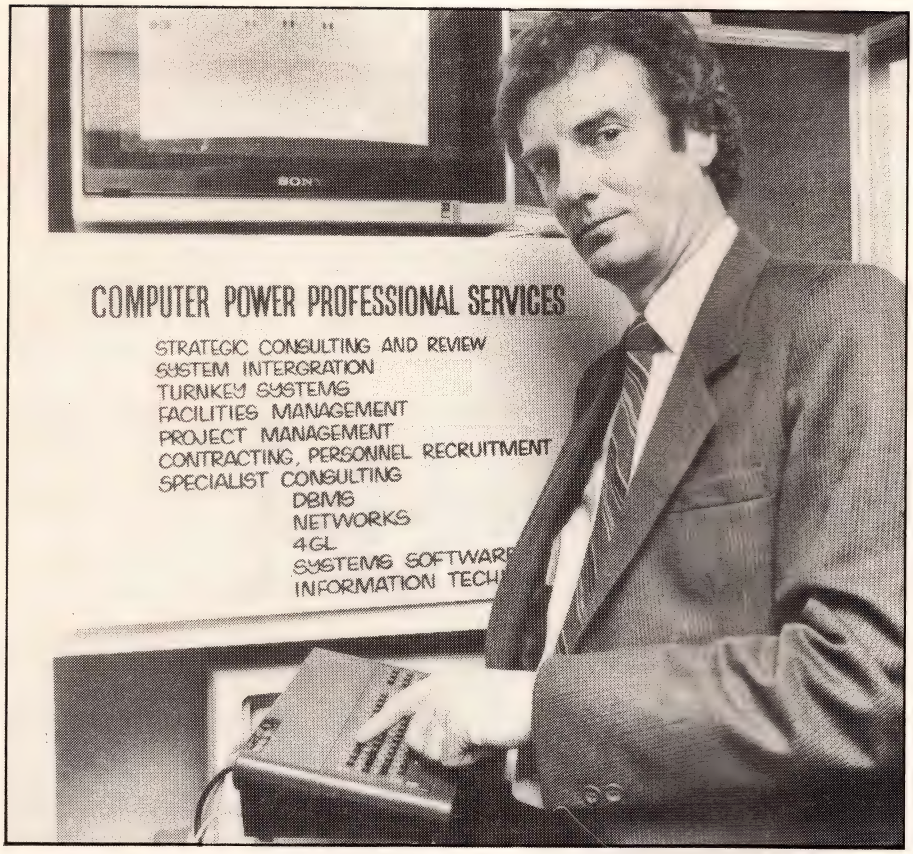
While there was a good selection of software suppliers and dealers, they were either offering off the shelf packages (AY Systems, Intelligence and Wordcraft) or a small selection of vertical applications (Archives, GT Micro, TNT Paywell). Australia's software applications industry was noticable by its absence.

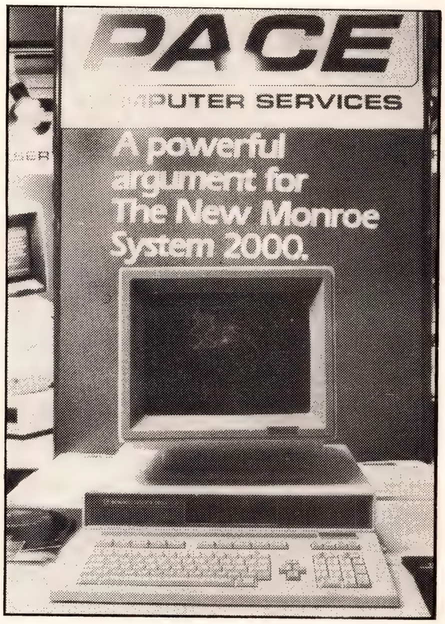
After the show, there was considerable comment about too many shows, and the claims of 27,000 visitors — compared to the 23,000 claimed for the PC 84 show — were met with scepticism.

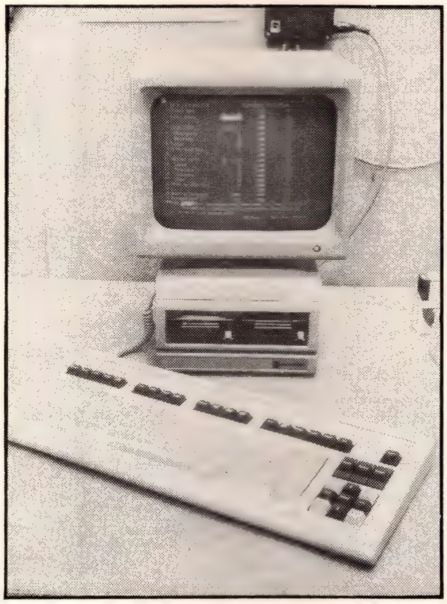
The Data shows have always been very political, with support from industry and business organisations. While this support provides good public relations, it is less important to small business.

Graphics Dimensions managing director Kevin Rebbechi's comments about "mouse joysticks" are indicative of the credibility gap of the Data shows. Comments about office automation being the direction for next year's show are just an excuse for not wanting to think about providing a show format that is of some use to small business looking for ways of using computers to improve productivity.

Machines launched at Data 84, clockwise from left: Computer Power's Videotex decoder; Monroe System 2000; IBM's 3270-PC; Plessey PC; Fox 2001 PC compatible.





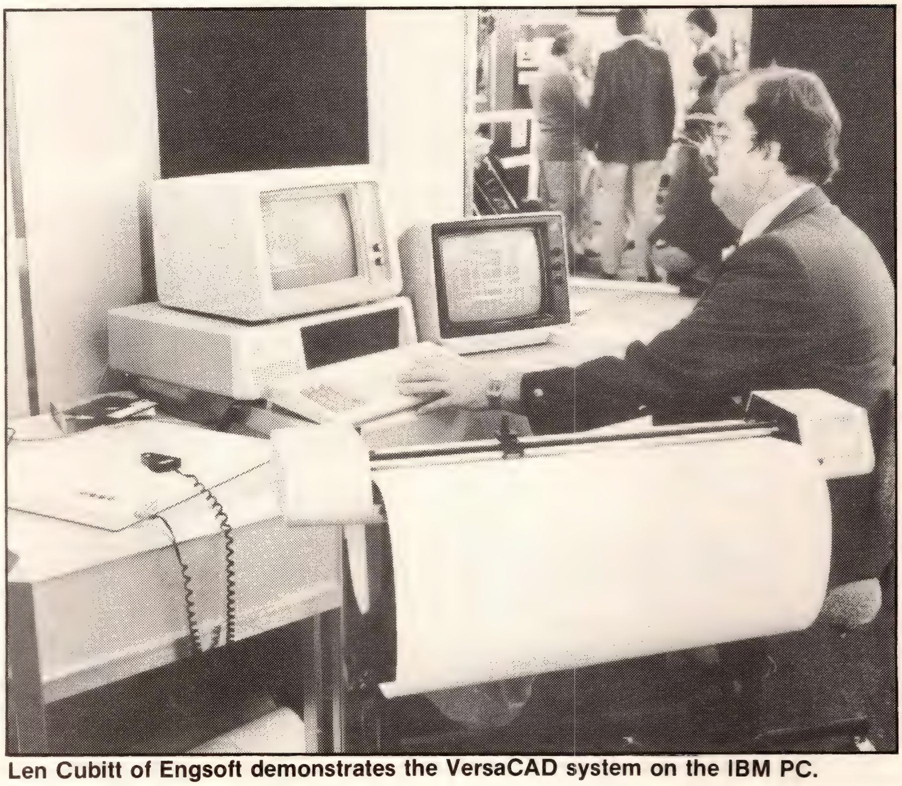


Real robots don't hang out at business computer shows — they are too busy earning their keep in factories and warehouses. Automach Australia '84 provided a welcome opportunity to witness these real robots in action, as Ian Robinson discovered . . .

AutoMach 84

A FORTUNATE and timely alternative to the entropy of Data 84 was provided by Automach Australia '84, a conference and exhibition dealing with the latest developments in automated manufacture and robotics technology. Hosted by the Society of Manufacturing Engineers, the Automach exhibition, held on May 23 to 25 at Sydney showground, evoked an air of excitement reminiscent of the original PC shows, as exhibitors demonstrated a multitude of computerised manufacturing systems, applications packages and industrial robots.

The Federal Minister of Science and Technology, Barry Jones, delivered the opening address in which he covered the issues of robotics, human factors in adopting new technologies, Australia's shifting balance of trade and the inability of tertiary institutions to provide suitably qualified graduates to industry. Jones presented the address in his own inimitable style, claiming that


Len Cubitt of Engsoft demonstrates the VersaCAD system on the IBM PC.

"the printout is on the wall..." with regard to manufacturing automation and the subsequent reallocation of jobs.

He quoted a US trade union leader, who claimed robotics would destroy 75 per cent of jobs in a factory, while failure to embrace robotics would destroy 100 per cent of jobs. The unionist said companies that failed to use robots would go to the wall. Jones advocated a rise in the national skills base, a move to high value-added products, and a bridging of the gap between academics and the real world.

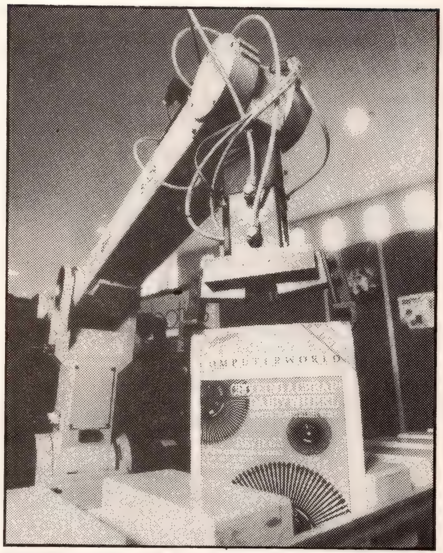
Robots dominated the Automach exhibition. An energetic collection of these mechanical workaholics welded, loaded, sorted and painted their way through the show, demonstrating the kind of speed and accuracy that could only be attributed to computer control. (The nearest Data 84 came to this was a rather pathetic token robot which staggered about in a random, radio-controlled ramble, banging into people's knees, mumbling incoherently, and generally making a nuisance of itself.)

Several IBM PC and Apple microcomputers were also evident at Automach. The growing presence of micros at such exhibitions serves to highlight future trends, as the evolving world of automated manufacture and robotics slowly moves within reach of individuals and small business.

The IBM display included demonstations of the AutoCAD and VersaCAD packages (designed specifically for the PC), as well as the new IBM Instruments Division CS9000 micro which has yet to be officially released in Australia. Microcomputers also featured in several of the Automach conference papers, (predominantly in the CAD/CAM section), including one describing in detail an Apple *II*-based X-Y translator system for CNC industrial laser cutting.

While the would-be drive toward the automated office often appears to be nothing more than a catchphrase of computer salesmen, the emergence of the automated factory is a very real prospect. The automated factory of the 1990s would involve computers in every stage of development, from contract bidding to raw material ordering, preliminary design, modifications and marketing, as well as in the automated manufacturing process itself. Such a concept would require a much higher level of functional integration than is now available, so a major step toward the drafting of industry standards — a fundamental aim of the Society of Manufacturing Engineers.

The ongoing Automach conferences are an important tool in this drive to standardise and they provide a rare opportunity for the public to see state-of-the-art robotics technology. Automach Australia '85 will be held in July next year at the World Trade Centre, Melbourne.



GMF robot on John Hart stand extracts a "defective" component.

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The Sydney Correspondence School has pioneered the use of networked microcomputers to serve administrative and teaching staff. Grahame Humphrey describes this innovative system that will provide a model for administrators

Corresponding with Computers An Important Success

THE Correspondence School in Sydney is using a microcomputer network for administrative and staff training purposes. The facility has been developed over three years by the school's computer co-ordinator, Grahame Humphrey, with the assistance of Alex Carter.

The school, which is staffed by 350 teachers and more than 50 clerical workers, is a NSW Department of Education central school catering for pre-school to HSC education of isolated children. They include those isolated by distance, by medical or physical handicap as well as students who are travelling for extended periods, overseas students, ballet students and those who are pregnant and unable to attend school. There are 4000 students, half of whom are doing part-time courses, mainly in foreign languages.

The microcomputer network at the school is monitored from a ground-floor room at the department's offices in William St in Sydney. It is based on an Omninet bus-topology and links 17 Apple //Plus and //e micros, each with 64K-bytes of RAM and a 40-col or 80-col green phosphor monitor. All units in the network have access to a 30M-byte Corvus Winchester hard disk.

Programs, data and sortwork volumes are controlled by Constellation II software protocol.

The network is a T configuration boosted by an Omninet Active-Junction Box and a 600 9v/mA transformer. It is linked together by 500 metres of single-twisted pair RS422 cabling transferring data at one million bits/sec.

There are five printers in the network: a Toshiba P1350 multi-mode 200 char/sec 132-col dot-matrix printer for general-purpose use, an Apple Silentype 60 char/sec, 80-col thermal printer for listing programs, two Apple Imagewriter 120 char/sec (53dB) high-resolution 80-col matrix printers (one in the library and the other in the accountant's office) and an Infoscribe 1000 200 char/sec, 132-col dot-matrix printer for reports.

There is a Corvus Utility Server, a network printer and time server which replaces a dedicated computer as printer server on the local area network. It allows printing to be directed from any terminal to a specified printer and automatically provides a time and date stamp on output.

The data storage is backed up by Omninet Mirror on to a U-matic video cassette recorder. There are three tape cartridges kept on all volumes.

The hard disk data storage, disk server and VCR backup are protected by a Mains Muffler 1000 watt electricity input filter. The network is capable of being extended to 1300m and will support up to 64 computer workstations.

Correspondence School computer co-ordinator Grahame Humphrey.

The Apple microcomputers are attached to the network via a Corvus Transporter interface tapped to a passive junction box.

There are two computer stations in the computer room. The first handles systems management. It has write access to all files, hard-copy reports on all files and has the utility server attached. It has dual disk drives. It can output to the Infoscribe printer via Centronics parallel interface. The second station in the room confirms all student enrolments and prints all mailing labels and teacher card labels. The station has write/read access to enrolment files and can handle volume printing of word processed material. It also has Duo Disk dual disk drives. The station is linked to the Toshiba printer via an Ice firmware interface.

The third station, in the registrar's office, has write/read access to plant, cassette recorders and B3/B4 files. It also has read-only access to overseas/PNG accounts and word processing. The machine has a dual disk drive, but has no access to a printer.

A station in the accountant's office has write/read access to overseas/PNG accounts and read-only access to student enrolment records. The machine has 128K-bytes of RAM and dual disk drives. It can handle spreadsheets and creditor/debtor/general ledger work. Hard copy reports and statements/remittance notices can be printed on the Imagewriter via a Super Serial RS232C interface.

The reception has a station with write/read access to student enrolments. All first enrolments are first stored on floppy disk and transferred to hard disk once each day. The machine has a dual disk drive but has no print facility. At present this station is not connected to the network.

A station in the mail room has write/read access to student enrolments (leavers and promotions) and to distribution of science kits to students. It has no disk input or print facility.

A station in the basement has write/read access to inventory files but has no disk input or print facility.

A station in the library has write/read access to library borrowings, accession register, but read-only access to student enrolments. It has dual disk drives and can output to the Imagewriter printer via Super Serial RS232C interface.

The station in the principal's office has read-only access to staff, student enrolments and overseas accounts. It has no disk or print facility.

One station in the English department has read-only access to library borrowings and student enrolments. It can handle internal administration and word processing and computer-aided instruction. The machine has dual disk drives but it has no printer facility.

The department's other station, operated by the head of the department and selected staff, has read-only access to files on full-time students. Programs include word processing, scaling of marks and tutorials, but there's no printing facility.

Two stations in the languages department access part-time student enrolment files. Both have word-processing capacity. One station is operated by the head of the department, while his second in charge operates the other.

A station in the social sciences department has read only access to full-time enrolment files, write access to department files for collecting students' marks and word-processing capacity. There is no printing facility.

The station in the School Certificate/PE/Music department has read-only access to student enrolments. It can be used for internal administration. It has a single disk drive but no printer facility.

The station in the mathematics department has read-only access to student enrolments. It can be used for programming, computer-aided instruction and internal administration. It has an RGB color monitor and dual disk drives, but there is no printer facility.

The final station, in the science department, has read-only access to distribution of science kits to students and student enrolments. It is used for computer-aided instruction and internal administration. It has dual disk drives and interfaces to the Silentype printer via a serial interface.

Three Apple //e machines are used for general administration in the primary school. Each has dual disk drives and an 80-col monitor. The master terminal is linked to a Facit 4510 160 char/sec 80-col dot-matrix printer via serial interface. It is envis-

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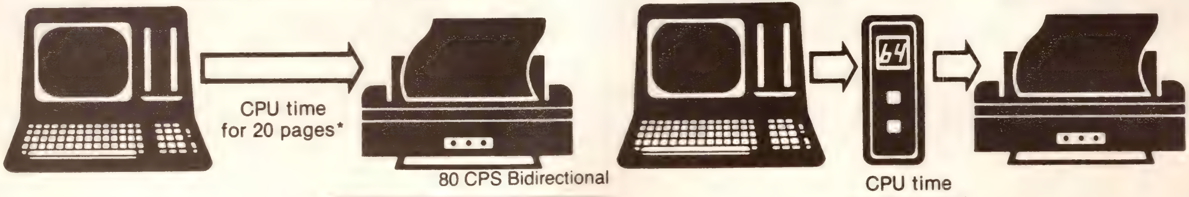

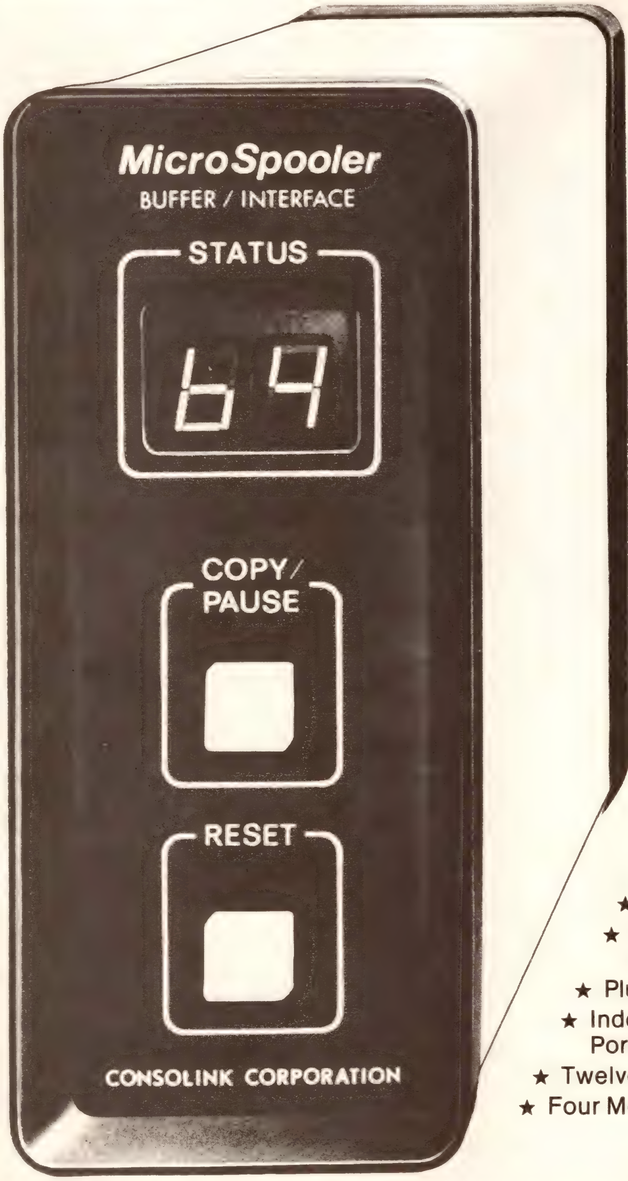

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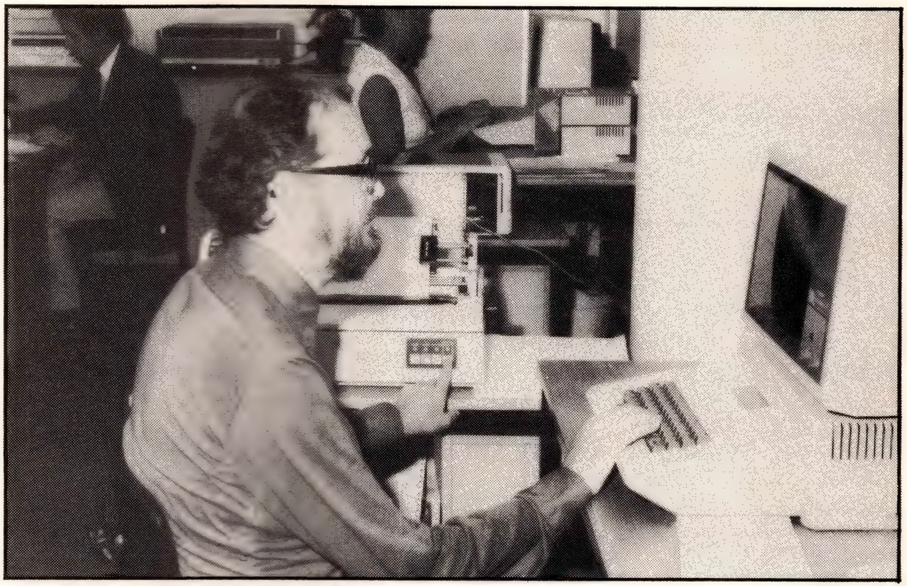
aged that these terminals will soon be connected with a program-sharing bus network; either an Omninet Apple share or an Apple bus network.

The computer room includes a standalone Apple //e which is equipped with dual disk drives and an 80-col green phosphor monitor. It is used for dedicated word processing, producing the school calendar, mail-merged letters on letterhead stationery, textbook forms, special reports and part-time schools mailing labels. It has access to a Xymec HY-Q 1000 daisywheel printer via a Centronics parallel interface.

This work will soon be transferred to the typing-room , which will use an IBM PC and a Brother HR-25 daisywheel printer. Software will be MultiMate, adapted from the Wang Word Processor. Another IBM PC in the computer room is used for the development work required.

The school is developing graphics programs on an Apple *//e* with dual disk drive using Graf Stik hardware and software. This computer will initially train Industrial Arts staff in computer-aided design and will eventually produce education software.



The school systems manager Alex Carter.

PROGRAMS

The network is configured to operate UCSD Pascal files only. Corvus Constellation II software handles system startup, password protocol, editing, filing, indexing, reporting and copying. There are also utility programs for diagnostics, controller card update and for operating the Corvus Mirror, semaphores, pipes and spooling, and archival storage system.

> ***The school is conducting trials on electronic mailing, videotex transmission of student course material and an internal electronic mail system***

The database software is Versaform, which is particularly suited to correspondence school tasks where up to 200,000 mailing labels and about 40,000 card labels and a multitude of reports, invoices and recall notices are printed every year. The applications include: inventories, invoices, accounts payable, personnel staff records, student records and transcripts, work-in-process tracking and capital equipment tracking.

Individual files vary in size from 128K-bytes to 2.56M-bytes. The software is capable of maintaining files up to 4M-bytes each. The software stores forms, not records, which have column line items as well as single items, such as name and address.

There is an extensive data entry checking capability — essential in the school's environment to eliminate operator mistakes. It includes: mandatory entry, numbers only, alphabet characters only, dates, format (phone numbers, postcode, part numbers, and so on), list of legal values, range, self-checking numbers, left or right justify, "yes" or "no" and minimum/maximum length.

There is automatic calculation on forms — extensions, course fees, column totals — and automatic data entry — subjects, fees, dates, names and so on — based on a code or course number. The B-tree index structure allows access to any record in less than three seconds.

Forms may be printed directly off the screen record or in a pre-formatted form and may be summarised into reports in an infinite variety of hard-copy layouts.

The software will support 80 x 24-character displays and VDU terminals as well as the standard Apple 40-character display with secondary page. The database will interface to text-processor programs to create and produce form letters, elaborate labels and other documents. All files can easily be transferred from floppy disk to hard disk and vice versa.

There are more than 160 error messages indicating Execute errors, specific I/O errors and system errors. There are also 18 different data files on the network.

All stations with floppy disk drive input can use any software not configured to run on slot 6 only. Software for individual (non-networked) workstations includes Multiplan for spreadsheeting, Zardax or Sandy's word processing and database programs, including PFS:File, PFS:

Report, "DB Master" and utilities, and Appleworks.

Programs written for teacher/school administration (teacher mark book, scaling, centralised class lists, and so on) include Lothlorien's Archive-Bibliography-Filing System and The Librarian's Assistant. Educational software includes CEGNSW public domain and MECC, Apple DOS 3.3 and ProDOS, UCSD Pascal language and operating system and Mastertype and Typing Tutor for keyboard tutorials used for staff training.

BACKUP

The hard-disk storage is backed up daily from the Corvus Mirror onto a videocassette driven by a JVC Model CR-6060E U-matic video cassette recorder. The backup may be an individual volume, drive or physical drive.

It takes 20 minutes to back up 10M-bytes of data. Each tape is then identified and verified for integrity. It is preferable to back up by volumes to isolate block errors. There are seven spared tracks on the Corvus to bypass block errors.

If files are corrupted or lost, the data may be restored from the tape by volume, physical drive, drive, manual or an extract. It's also possible to back up hard disk files onto floppies. Hard-copy reports of all files are stored in labelled folders on racks, and there are already 98 such hard-copy files.

STAFF TRAINING

Two teachers are available to answer queries and manage the network. There are also 23 staff members using the computers daily and regular staff are briefed frequently and are kept informed of all new developments.

Most of the typing staff have had inhouse word-processing training. The school conducts two three-hour evening courses every term which are available to 24 participants from both the teaching and clerical staff. It introduces staff to computer usage in the school.

Two two-hour courses are also conducted weekly for six selected teachers on specialised applications such as word processing, computerised accounting, software evaluation, computer-assisted instruction, or database construction.

It is anticipated that at least 230 staff at The Correspondence School will have had at least four hours inservice training on inhouse computer usage by the end of the year.

All training is conducted by one or both of the computer support teachers.

DEVELOPMENTS

The JVC U-matic VCR backup will eventually be replaced by a Corvus Bank Random Access 200M-byte memory. This features removable 200M-byte tape cartridges, facilitating and improving backup while providing online random access search and high capacity archiving.

It is anticipated that the school will next year develop computer awareness and possibly computer science courses for students. This will mean the introduction of further non-networked microcomputer workstations (probably Atari 800XLs) and a more sophisticated inservice training program for teachers.

The school is conducting trials on electronic mailing and videotex transmission of student course materials. An electronic mailing system is being developed for the LAN. This will enhance the usefulness of the network with an ability to send memos, phone messages and transfer files.

Up to 25 users can be serviced. It is the first stage in the implementation of modem linking to distant networks associated with the regional offices, head office and eventually schools.

It is also expected that more extensive use of word procesing on Apple //es and the introduction of portable Apple //cs and Apple Macintoshes for courseware (leaflet) production will be possible in 1985-86.

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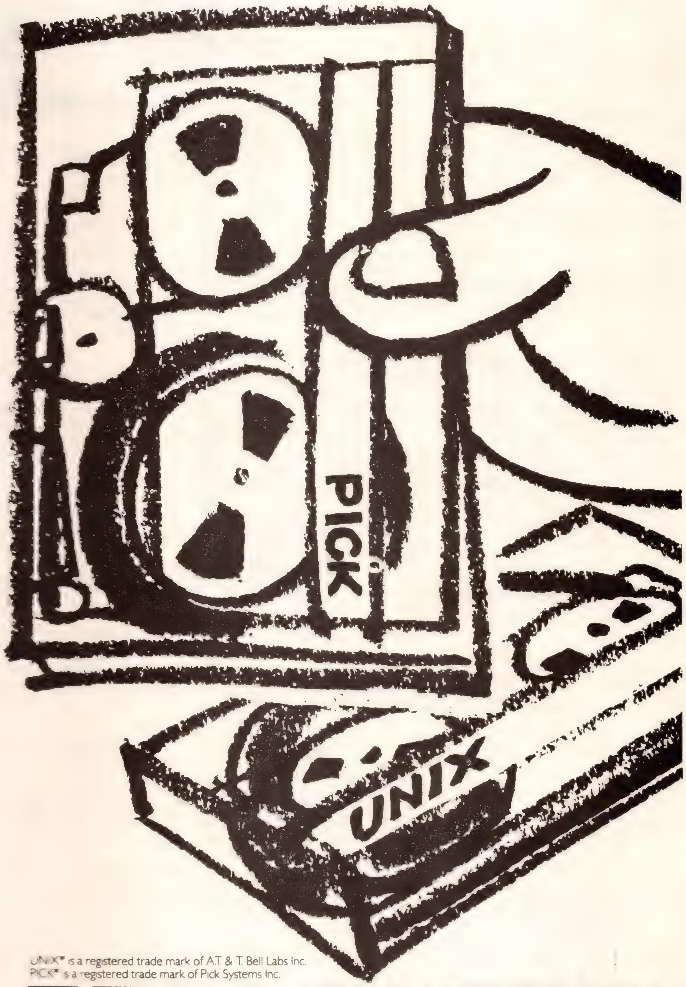

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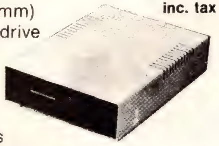

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SYSTEMS

Performance boost

ARCHIVES Computers Australia says enhancements for the Discovery Multiprocessor and Discovery 500 increases I/O performance by 45 per cent, particularly multi-user response times. Following the inclusion recently of Digital Research's CP/M Plus, the Discovery is claimed to be the only multiprocessor system supporting all three CP/M operating systems — CP/M-80, CP/M Plus and CP/M-86. The enhancements which are available to present Discovery users, include 32M-byte files with the ability to address up to 512M-byte logical drives (16), bank switchable operating systems, password protection and time date stamping on files.

Further information: Archives Computers, 163 Claredon St, South Melbourne, Vic 3205. Tel: (03) 699 8377.

Enter U532 on Enquiry Card

SME's Knight

SME Systems has announced the Knight 2000 microcomputer priced at $3800 including tax. Features include Z80 microprocessor, 256K-bytes of memory, CP/M 3 operating system, dual 780K-byte floppy disk drives, high-resolution graphics, voice synthesiser, interfaces and an optional 20M-byte hard disk drive.

Further information: SME Systems Pty Ltd, 22 Queen St, Mitcham, Vic 3132. Telephone: (03) 874 3666.

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Oce simplicity

OCE/CPT has announced a low-cost, single-station word processing system designed specifically for users who wish to progressively enhance their equipment. The Oce/CPT 8501 offers an entry level that enables users to begin immediately dedicated word processing functions, including full-page display and simultaneous imput/output operations. The user can also add communications hardware and software modules, link systems, share resources such as files and databases, and introduce concurrent WP and DP functionality from the same base unit.

Further information: Oce-Reprographics Ltd, 89 Tulip St, Cheltenham, Vic 3192. Telephone: (03) 584 1011.

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HeadStart option

INTERTEC will distribute Concurrent CP/M-86 version 3.1 from July as an option with its HeadStart microcomputer. The company says HeadStart provides up to 1M-byte of user memory and has 8 and 16-bit processors, a 3½in microfloppy disk drive, an internal RAM disk and networking capability. MS-DOS and CP/M-80 are offered standard. Concurrent CP/M-86, a multitasking operating system designed for micros that use the Intel 8086 or 8088 CPU, will be offered as an option.

Further information: Intertec, 2300 Broad River Rd, Columbia, Ohio, US.

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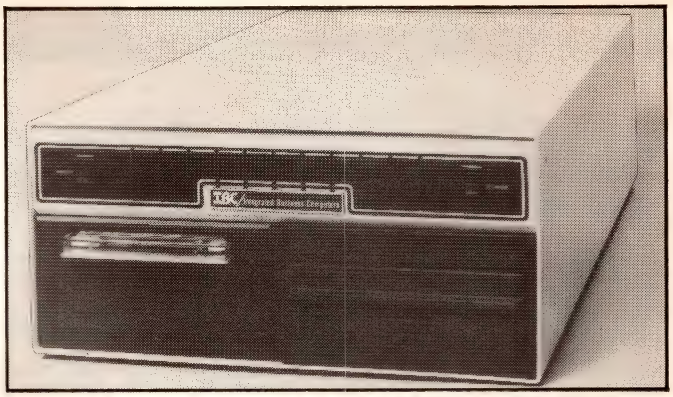
SME Knight 2000 microcomputer.



Integrated Business Computer's 8-bit Super Cadet.

Super Cadet

INTEGRATED Business Computers of the US has announced its largest 8-bit business computer, the Super Cadet. The Super Cadet accommodates up to 16 users and features up to 640K-bytes of RAM memory, high-speed 8MHz Z80H CPU and fast memory management capability. The system is compatible with the Oasis and MP/M II operating systems. Other features include 256K-bytes of 120n/sec memory, a 1M-byte floppy disk drive, 85M-byte hard disk unit, eight serial I/O ports, Centronics port, and 30in desktop cabinet. The Super Cadet cost $US15,095.

Further information: Integrated Business Computers, 21592 Marilla St, Chatsworth, CA91311, USA.

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Pulsar TurboDOS

PULSAR Electronics has released the Pulsar Series 7000 TurboDOS computer system in Australia. The Series 7000 is a one-to-four user system (with each user having his own Z80A microprocessor and 64K-bytes of RAM). Mass storage is handled by a combination of hard disk (to 100M-bytes), 5¼in 1.4M-byte mini floppy and 5M-byte removable hard disk. Power supplies are available to 15 amps. System boot-up is via the hard disk with a key operated reset/power on function.

Further information: Pulsar Electronics Pty Ltd, Lot 2 Melrose Dr, Tullamarine, Vic 3043. Telephone: (03) 330 2555.

Enter U537 on Enquiry Card

School micro

SYSTEMS Peripherals is offering the Vectorio 64Z microcomputer to schools for less than $500. It says the 64Z offers Apple // CP/M hardware and software compatibility, 6502 and Z80 microprocessors, 64K-bytes of expandable RAM, seven expansion slots, fully programmable keyboard, upper and lower case, separate numeric keypad, full graphics, joystick port and 40-column text display. The 64Z is also being offered to schools for less than $1000 with one disk drive and a monitor.

Further information: System Peripherals, 210 Parramatta Rd, Stanmore, NSW 2048. Telephone: (02) 568 3790.

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Datatel clones

DATATEL has released a series of personal computers from Direct Inc of California, US. Datatel says the computers are fully IBM PC compatible, both in hardware and software, and will communicate and exchange data with IBM, Digital Equipment, or Hewlett-Packard mainframes. The basic system comes with 128K-bytes of memory, two floppy disk drives and monochrome monitor and costs $3661 plus tax. A system with 10M-byte Winchester disk, 256K-bytes of memory, one floppy disk drive and a monochrome monitor costs $5772 plus tax.

Further information: Datatel Pty Ltd, 19 Raglan St, South Melbourne, Vic 3205. Telephone: (03) 690 4000.

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Canon VP

CANON's new VP 2000 word processing system was unveiled at the Office Expo '84 held recently in Canberra. The VP 2000 consists of a single or dual-disk drive and a visual display unit, and interfaces with Canon electronic typewriters converting them to full-feature word processors. It is available either as a complete system, including a typewriter, or the disk drive and visual display unit can be connected to an existing typewriter. The 16-bit CPU runs MS-DOS. Software includes WordStar and Mail Merge.

Further information: Canon Australia Pty Ltd, 1 Hall St, Hawthorn East, Vic 3123. Tel: (03) 20 1331.

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Discovery improves

ARCHIVES Computers has released a number of software and hardware enhancements for the Discovery multiprocessor and Discovery 500 computers. I/O performance has risen 45 per cent. With the recent inclusion of Digital Research's CP/M Plus, the Discovery is claimed to be the only multiprocessor system in the world supporting all three CP/M operating systems; CP/M-80, CP/M Plus and CP/M-86. The Discovery's operating system, dcp/os has been rewritten to take advantage of the enhancements.

Further information: Archives Computers, 163 Clarendon St, Sth Melbourne 3205. Telephone: (03) 699 8377.

Enter U601 on Enquiry Card

Digilog upgrade

COMPUTER Enterprises has announced an upgrade to its Digilog DBS-16 supermicro, allowing it to read a wide variety of other manufacturers' disk formats.

Further information: Computer Enterprises Pty Ltd, Suite 504, 4 Help St, Chatswood, NSW. Tel: (02) 419 8577.

Enter U602 on Enquiry Card

New GENeration

SIGMA Data Corp has announced the release of the latest member of the Convergent Technologies' family of workstations, the NGEN (New GENeration). NGEN is 25 per cent faster than the current AWS and IWS product lines but is 5 to 20 per cent cheaper. NGEN's modular design enables users to perform much of the installation and diagnostics themselves. The key to NGEN is Convergent's proprietary X-bus which has been designed for the easy addition of memory or disk modules and cartridges which are self-contained and sealed. The X-bus provides the connection for each electronic module in the system. Each NGEN workstation comprises a series of discrete modules. The basic NGEN system contains a 16-bit microprocessor with 256K-bytes of RAM expandable to 1024K-bytes in 256K-bytes increments. Users expand the memory by adding one, two, or three 256K-byte RAM expansion cartridges. The 5¼in disk drive modules are housed in identical enclosures. As with memory, the disk modules are attached to the rest of the system via the X-bus. Within the cluster, users can have access to very large high performance disk files up to 80M-bytes a drive. The maximum hard disk storage that can be configured in a single workstation is 160M-bytes. Users are able to test their NGEN system by using Visinostics, a tool which displays a graphic representation of the system configuration on the NGEN screen. The user can select which components are to be tested. The standard monochrome monitor displays 29 lines of 80 characters and sits on a tilt and swivel base, has a non-glare coating and easily accessible brightness controls. The color monitor display also has 29 lines of 80 characters and is attached to the system via a graphics controller. It can display eight colors out of a palette of 64 colors. The keyboard is connected to the base of the monitor by a 2m coiled cable which may be connected to either the right side or left side of the keyboard itself.

NGEN workstation.

NGEN workstations can stand alone or they can be connected together in a local area network via a high-speed link sharing peripherals and databases, forming an office cluster. The operating system supports CTOS, Cobol, Fortran, Basic, C, Pascal and assembler languages. CTOS also hosts MS-DOS Version 2 and CP/M-86. A range of data management tools, including CT-DBMS, ISAM, Query and Forms and a variety of data communications packages for industry standard communications environments, are available. Business graphics as well as applications software from Sigma Data and OEMs are available.

Further information: Sigma Data Corp, 157 Walker St, Nth. Sydney 2060. Tel: (02) 436 3777.

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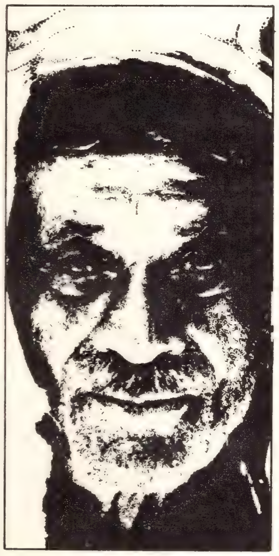

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PERIPHERALS

The new Webster ST97 terminal.

First terminal

WEBSTER Computer has released its first video terminal. The terminal has been designed as a complementary video peripheral to the Spectrum II range of computers, and is designed and built at the company's plant in Bayswater, Victoria. The terminal is called the ST97. It is also compatible with Digital Equipment Corp's PDP-11 systems.

Further information: Webster Computer Corp Pty Ltd, 17 Malvern St, Bayswater, Vic 3153. Tel: (03) 729 8444.

Enter U508 on Enquiry Card

Multi-font Facit

A NEW multipurpose dot-matrix printer for both text and label printing has been introduced by Facit. Called the Facit 4528, it is a medium-speed (165 char/sec) dot-matrix, uni/bi-directional, logic seeking printer. Features include multifont capability, the ability to print 12 different types of bar codes and four matrix fonts.

Further information: EAI-Electronic Associates Pty Ltd, Unit 4, 2 George Place, Artarmon, NSW 2064. Tel: (02) 427 3322.

Enter U509 on Enquiry Card

Microbee Enhancer

THE Microbee Enhancer 1 released by Vitronics has an inbuilt four-channel sound synthesiser and speaker which can produce sound effects and music even while an image is moving around the screen. All popular joystick formats are directly connectable. Two Atari and two TRS color computer joystick inputs are provided, enabling games playing, and graph and chart producing. Touch pads, mice, trackballs and paddles can be connected. It can also be used to teach music, mathematics, geometry and geography. A user's voice can be digitised using a digitisation program (an input is provided). The standard Version A is suitable for all newer Microbees with the 1.5 amp rated powerpack and costs $139. Version B costs $149, and is suitable for all Microbees with the older 1 amp powerpack.

Further information: Vitronics, 109 Lawrence Rd, Mt Waverley Vic 3149.

Enter U510 on Enquiry Card

Interface boards

THREE new computer-to-IEEE-488 bus interface boards have been introduced by National Instruments. The interfaces are low-cost ports to the IEEE-488 general purpose instrumentation bus for: multibus computers such as the Apollo, Sun, Codata and NCR Tower (GPIB-796P); S-100 computers such as the Zenith Z-100 (GPIB-696P); and SBX I/O exp. boards such as Intel's single board computer family (GPIB-SBX). As well as the GPIB functions, the GPIB-796P and GPIB-696P boards have optional SBX interface connectors allowing multifunction capability via piggyback SBX boards, such as A/D converters, time-of-day clocks, speech synthesiser, bubble memory and disk controllers. SBX modules are available from Intel, National Semiconductor, Zendex and National Instruments. Comprehensive software drivers and handlers are priced separately. A software handler installed as part of Z-DOS supports the GPIB-696P in Zenith Data Systems Z-100 computers. A software handler, installed as part of Unix, supports the 796P on computers such as Sun, Codata, NCR Tower and others.

Further information: Elmeasco Instruments Pty Ltd, 15 McDonald St, Mortlake, NSW 2137. Tel: (02) 736 2888.

Enter U511 on Enquiry Card

20-sec coverage

THE TEKTRONIX 4115B high-resolution color display monitor, with its palette of 16 million colors and 256 visible colors, auto converges the three electron guns in a color monitor in less than 20 seconds, thus combatting misconvergence. A photo-detector picks up light from the indexing phosphors; a microcomputer then compares instantaneous beam positions with factory specifications; convergence corrections are generated to make the two coincide. The result is sharpness of fine lines and alphanumerics and true color even in corner areas.

Further information: Tektronix Aust Pty Ltd, 80 Waterloo Rd, Nth Ryde, NSW 2113. Telephone: (02) 888 7066.

Enter U512 on Enquiry Card

Ink-jet color

ADE has announced the availability of two printers, the Quadjet ink-jet color printer and the Letter Pro 20. The Quadjet, with 640 dots/line resolution, has a Centronics parallel or RS232C interface and eight software-selectable character sizes. The Letter Pro 20 prints at 20 char/sec. Features include 100 different type styles and removable multi-strike ribbon cartridges.

Further information: Anderson Digital Equipment Pty Ltd, 14 Whiteside Rd, Clayton, Vic 3168. Tel: (03) 544 3444.

Enter U513 on Enquiry Card

S-100 RAM card

AED Computers has introduced a new Australian-made 64K-byte static RAM card called Memoraed. The new card is suitable for any existing S-100 system and supports clock speeds up to 10MHz without wait states. The card complies with the IEEE-696 S-100 specification. IEEE-696 8- and 16-bit operation is fully automatic as the card responds to 16-bit requests. AED has also introduced a new S-100 serial card called Seraed, intended to replace the US-made CompuPro 8-port serial card which the company has marketed and used in its Universe Supercomputer in the past. The new card is available for use in any existing S-100 computer that requires additional serial capability, especially multi-user systems.

Further information: AED Computers Pty Ltd, Unit 3, Prospect Industrial Centre, 2 Stoddart Rd, Prospect, NSW 2149. Telephone: (02) 636 7677.

Enter U514 on Enquiry Card

Ether-Series

IMAGINEERING has released the Ether-Series networking products for the IBM PC. The series comprises EtherLink, EtherShare, EtherPrint and EtherMail. EtherLink ($1364 ex tax) connects a PC to Ethernet, EtherShare ($790 ex tax) lets users share hard disks on a network server, EtherPrint ($790 ex tax) converts any PC to an electronic mail terminal.

Further information: Imagineering, 579 Harris St, Ultimo, NSW 2007. Tel: (02) 212 1411.

Enter U515 on Enquiry Card

Virtual memory

MOSTYN Enterprises has announced the release of a 68010 multibus CPU board running at 12.5MHz. The board, designed by Central Data Corp of the US, supports a full demand-paged virtual memory operating system with interfaces to Intel's Multibus and ILBX (including bus-vectored interrupts). Mostyn has also released a multibus 10MHz Z8000 CPU board, also from Central Data. Up to 16M-bytes of multibus address space is provided. Mostyn has also released three new ½in, 9-track, 800/1600 bits/sec tape subsystems for small computers.

Further information: Mostyn Enterprises Pty Ltd, 35 Alexander St, Dundas, NSW 2117. Telephone: (02) 871 6297.

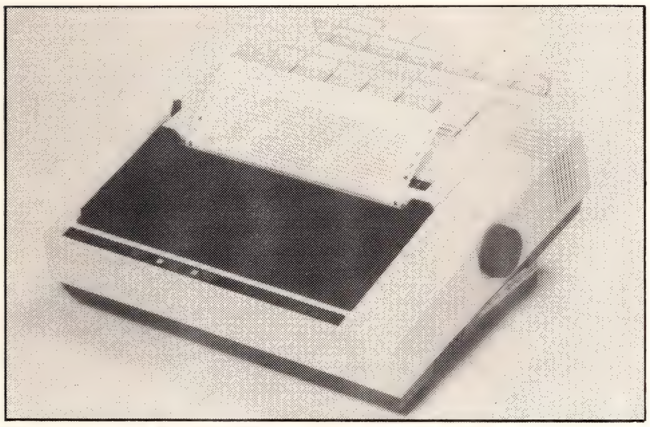
Enter U516 on Enquiry Card

Financial Link

SI PRODUCTS, the Australian subsidiary of Software International, has announced a financial applications micro-to-mainframe link designed for the IBM PC. The company's plans called for accepting orders for Smart Link in April, with deliveries starting in May. Smart Link, which can be installed in 15 minutes, works with many popular spreadsheets, including Lotus 1-2-3, VisiCalc and Multiplan

Further information: SI Products (A'asia) Pty Ltd, 55 Lavender St, Milsons Point, NSW 2061. Tel: (02) 92 0811.

Enter U517 on Enquiry Card



The Impressions SC-1000 100 char/sec dot-matrix printer.

Printer Impressions

SOFTWARE Australia has announced the release of three dot-matrix printers — the Impression SC-1000, the KEL 3180 and the Shinko Impressions S1310. The KEL 3180 ($1245 plus tax), is an 18-pin printer capable of 180 char/sec at full speed and 90 char/sec at near letter quality. The SC-1000 ($400 plus tax) is capable of 100 char/sec while the S1310 ($1995 plus tax) is capable of 300 char/sec in near-letter quality mode.

Further information: Software Australia, 2 Somerfield St, Mt Gravatt, Qld 4122. Telephone: (07) 349 4877.

Enter U518 on Enquiry Card

Floating point

HIGH-SPEED floating point hardware is now available for the CRDS Universe computer series. The versabus board made by Sky Computer takes up one slot in the versabus backplane. UNOS Version 3.0b supports the implementation and Fortran 77, Pascal and C. Cobol has been modified to include the necessary calls to the hardware. Speeds obtained by the Universe with the board have been measured at 280-290K-whetstones. This speed is similar to the Vax-11/750 which is rated at 330K-whetstones. A Vax-11/780 with floating point accelerator is rated at 1.1M-whetsones. The new unit provides high-speed single-precision (32-bit) and double-precision (64-bit) arithmetic. A Universe 68 configured for scientific applications includes floating-point hardware, 32M-byte Winchester disk, and 1M-byte of high-speed main memory and costs about $30,000. In contrast, typical superminicomputer configurations designed for scientific applications typically cost at least $100,000. The Universe 68 floating-point unit is mounted on a single versabus printed circuit board. The recommended list price for the unit is $3500. Deliveries are available within 45-60 days.

Further information: Intelec Data Systems, 217 Blackburn Rd, Mt Waverley, Vic 3149. Telephone: (03) 233 1844.

Enter U519 on Enquiry Card

Tournament Master

UNIVERSAL Software has announced the release in Austalia of the Tournament Master joystick. The stick, which can be operated on any surface (including a lap position), has built-in auto-fire circuitry, right-to-left-handed player mode selection, and comes with a canvas carry bag and 4m length of coiled cord.

Further information: Universal Software Pty Ltd, PO Box 583, Cowandilla, SA 5033. Tel: (08) 352 7911.

Enter U520 on Enquiry Card

Apple sounds

THINKING Systems has announced the release of Decillionix DX-1, a sound processing system for Apple *II* computers. The DX-1 records, processes and plays back ordinary sound. The sound can be modified by the computer. Sounds are converted to digital data through a high-speed analogue-to-digital converter; software routines are then selected (or programmed) for playing and sequencing the sound data; the data is then output to a digital-to-analogue converter where sounds are reconstructed. The software can speed up, slow down, play backward, forward and sequence sounds in any way. Some possible applications of the DX-1 include audio and video sound effects recordings, visual presentations, musical instrument accompaniment, studio uses, automatic telephone greeting effects/messages and entertainment.

Further information: Thinking Systems, PO Box 260, Cammeray, NSW 2062. Tel: (02) 90 6868.

Enter U521 on Enquiry Card

Large buffer

THE GLW MXCB-64 Centronics printer buffer enhances the Epson FX/MX/RX-80/100 printer by providing a large buffer capacity. The low-cost buffer is capable of storing up to 64K-bytes of data at high-speed and passing it on to the printer at low speed. The buffer is large enough to hold 30 to 60 typewritten pages (depending on how much of each line is actually printed). The GLW buffer provides selectable space compression for spreadsheet work, allowing more than 64K-bytes of data to be stored in the buffer. There is provision for reprinting of information stored unlimited in the buffer. The buffer may be cleared if printing is to be aborted. The GLW MXCB-64 fits into the Epson printer on the standard mounting posts and installation/operation instructions are supplied with each unit.

Further information: GL Wragg, 4 Pryton Crt, Balwyn, Vic 3103. Tel: (03) 890 6918.

Enter U522 on Enquiry Card

Mounted modem

NETCOMM (Australia) has announced the release of an internally mounted direct connect modem for Apple *II*+, *IIe* and *III* computers and the IBM PC. The modem comes with integrated auto-dial slimline handset and approved connection to a telephone socket. The Datanetcomm modem complies to both CCITT V.21 and V.23 standards. The modem supports synchronous connection to mainframe hosts, such as IBM 3270 bi-sync, IBM 2780/3780 BSC, IBM 3270 SNA/SDLC plus Burroughs, Univac, Facom, ICL and Honeywell. It also supports asynchronous transmission (for example Dec, Wang, Prime) connections plus Dow Jones, Source, Midas, Tymenet, Csironet, Telenet and so on. The modem supports: answer or originate mode; auto-answer, auto-disconnect; auto-dial (but not contravening the US Eaton Patent); manual dial (with auto redial); and voice or data modes.

Further information: NetComm (Aust) Pty Ltd, 8/33 Ryde Rd, Pymble, NSW 2073. Telephone: (02) 498 5577.

Enter U523 on Enquiry Card

Maxtor drives

THE peripherals division of Pericomp has gained Australian distribution rights for the Maxtor family of Winchester disk drives. Maxtor drives are available in 65, 105 and 140M-byte (unformatted) capacities, with full industry standard interfaces, formats and power supply compatibility. Physical dimensions and mounting holes of the drives are identical to those of the ST506/412 and standard 5¼in floppy drives, and transfer rate is 5M-bits/sec.

Further information: Pericomp, 345 Wickham Terrace, Brisbane 4000. Tel: (07) 229 9200.

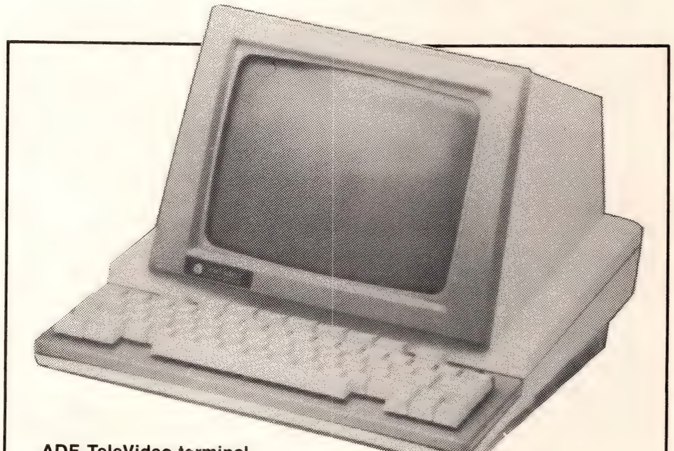
Enter U524 on Enquiry Card

ADE terminals

ADE has released two new terminals and a graphics package for Dec terminals. The TeleVideo personal terminal ($800) is aimed at corporate users, while the Intercolor 2427D is a low-cost, high-resolution color terminal, featuring 64 colors and bit-mapped graphics. The Retro-Graphics package upgrades Dec VT100 and VT132 video terminals into powerful bit-mapped graphics performers.

Further information: Anderson Digital Equipment Pty Ltd, 14 Whiteside Rd, Clayton, Vic 3168. Tel: (03) 544 3444.

Enter U525 on Enquiry Card



ADE TeleVideo terminal.

Talking back

KEPCO Inc, of the US, has announced an interface that talks as well as listens. The device, called TLA (the talker-listener adapter), communicates with computer-controllers using CIIL langauge over an IEEE-488 bus. CIIL is the control interface intermediate language chosen by many ATE makers, and is used, for example, in the US Air Force Mate program. TLA recognises and responds to the nouns and verbs of the CIIL using a built-in 8088 CPU to drive field-installable analogue cards that can each handle up to four independent power supplies. Since the TLA can accommodate up to four such plug-in cards, the entire system can issue commands to (and receive information from) up to 16 of Kepco's programmable power supplies.

Further information: Elmeasco Instruments Pty Ltd, 15 McDonald St, Mortlake, NSW 2137. Tel: (02) 736 2888.

Enter U526 on Enquiry Card

Nec printers

A NEW series of dot-matrix printers from Nec has been released in Australia through Datascape, which took delivery of the P2/P3 in May. The P2/P3 has an 18-wire staggered array print head allowing 180 char/sec high-speed printing, medium-speed enhanced-quality at 90 char/sec and premium-quality printing at 30 char/sec. A range of plug-in interfaces is available, including standard serial, parallel, and a special unit for the IBM PC.

Further information: Datascape Int. Pty Ltd, 44 Avenue Rd, Mosman, NSW 2088. Telephone: (02) 969 2699.

Enter U527 on Enquiry Card

Tower controller

NCR Australia has released a multi-protocol communications controller called the Tower 16321 for its 16-user Unix machine. With the single-board controller, up to eight terminals can communicate with one or more IBM SNA-compatible mainframes on four independent channels, using any mix of SDLC or BSC protocols. The associated software package allows the Tower system to appear as a cluster controller to the SNA-compatible network. IBM 3270 emulation allows the user to access mainframe programs running under the host's TSO time-sharing or interactive CICS/VS and IMS/VS operating systems. Alternatively, the user program can appear to the SNA host as the operator of an interactive IBM 3270-type terminal. IBM 3770 remote job entry is also supported. In this mode a Tower user may transfer data to and from the host system. Host jobs may also be initiated at a Tower terminal and results of these jobs received back via the Tower.

Further information: NCR Australia, 8 Napier St, Nth Sydney 2060. Tel: (02) 922 0161.

Enter U528 on Enquiry Card

X-Y recorder

LINEAR Instruments has announced the release of a low-cost X-Y recorder, the model 8036. The unit features 50uV/cm sensitivity with 13 calibrated input ranges up to 0.5V/cm plus a continuous vernier on all ranges, providing 10:1 attenuation. An 18-speed timebase is provided as a standard feature, giving speeds of .1sec/cm to 50min/cm. Input range accuracy is quoted at plus or minus 0.3 per cent FS, including linearity and deadband at 20°C. As well as the front panel jacks for signal input, a back panel connector allows remote operation of pen lift, timebase and external clock. Although the recorder will accept up to A3 size paper, it is compact enough to be fitted to 19in racks, if required.

Further information: Elmeasco Instruments Pty Ltd, 15 McDonald St, Mortlake, NSW 2137. Tel: (02) 736 2888.

Enter U529 on Enquiry Card

Osborne upgrades

RC ELECTRONICS is offering a number of upgrades for the Osborne 1. It has A V Bios, a package offering more disk space, more disk types and 70 function keys. It also offers Super 1-0, a hardware upgrade which comprises three internally mounted disk drives giving 1.8M-bytes capacity, calendar clock and software selectable baud rates from 75 to 19,200.

Further information: RC Electronics, 72 Spofforth St, Holt, ACT 2615. Tel: (062) 547 608.

Enter U530 on Enquiry Card

Dynamic RAM

MICRO Memory Inc has announced the release of its new MM-9000D dynamic RAM board for the Multibus (IEEE-796). When populated with standard 64K-bit chips, the MM-9000D provides a maximum of 1M-byte of dynamic memory with parity generation and checking. Using 256K-bit chips, the board's capacity is increased to 4M-bytes of memory on a single board. The MM-9000D is available from the factory with six different memory capacities: 512K-bytes 768K-bytes, 1M-byte, 2M-bytes, 3M-bytes and 4M-bytes.

Further information: Unitronix, 43 Amelia Ave, Wheeler's Hill, Vic 3150. Tel: (03) 561 4934.

Enter U531 on Enquiry Card

3M COMPUTER DISKETTES for Business & Home

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5¼" SINGLE SIDED DOUBLE DENSITY PRECISE DISKETTES Norm. $49.00

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5¼" SINGLE SIDED DOUBLE DENSITY (BULK — PER 10 DISKETTES)	— R.R.P. $45.00	29.95
8" SINGLE SIDED DOUBLE DENSITY	— R.R.P. $63.50	39.95
8" DOUBLE SIDED DOUBLE DENSITY	— R.R.P. $76.50	46.95

3M SCOTCH HEAD CLEANING KITS

5¼" Norm. $45.00	34.95
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☐ Enclosed Cheque ☐ Debit Bankcard/Diners Club/American Express

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MICRO NATIONWIDE PTY. LTD.
PO. Box 653. Mona Vale. NSW 2103
Telephone (02) 99 1772. (02) 997 3317

Enter U001 on Enquiry Card

COMMUNICATIONS

World Modem

DATA Sat has developed a leased-line version of the World Modem Model II and has obtained Telecom authorisation for connection directly onto point-to-point leased lines. The World Modem Model ZZ-2W supports 300 full duplex Bell or CCITT and 1200 half duplex Bell or CCITT transmission standards. The modem incorporates a built-in, heavy-duty power supply rated for continuous use, seven status indicators and self-diagnostics.

Further information: Data Sat Australasia Pty Ltd, Suite 5, 522-524 Kingsway, Miranda, NSW 2208. Tel: (02) 525 6688.

Enter U500 on Enquiry Card

Classic range

COMPUTER Classics has announced the introduction of a complete range of communications modems consisting of five models — Sendata 700 acoustic coupler ($299), Cicada 300 direct connect modem ($299), Cicada 300T direct connect modem ($249), and Computer Classics' 300T direct connect modem for Commodore computers ($299).

Further information: Computer Classics, 11-15 Falcon St, Crows Nest, NSW 2065. Telephone: (02) 438 4866.

Enter U501 on Enquiry Card

BG modem cards

THE BG range of custom-designed modem cards from Sendata Communications is now available in Australia. Cards can be made to cover data rates of 75 to 1200 bits/sec complying with relevant CCITT & Bell standards. Cards are provided with a standard RS232 interface, but other special interfaces to customer specifications can be supplied. Automatic answer and disconnect functions and auto-dialling (with associated software) are available.

Further information: Electro-Medical Engineering Pty Ltd, 69 Sutherland Rd, Armadale, Vic 3143. Tel: (03) 509 5844.

Enter U502 on Enquiry Card

Wicat interface

WICAT Computer has announced the availability of a new intelligent communications interface (ICI) board for use with the Wicat multibus product line — Wicat Systems 150, 155 and 160. The board features a local 8MHz processor dedicated to handling character I/O, and contains 16K-bytes of RAM and local program and data storage.

Further information: Wicat Computer of Australia Pty Ltd, 88 Christie St, St Leonards, NSW, 2065. Tel: (02) 438 2911.

Enter U503 on Enquiry Card

Fastlan answer

WANG has introduced the WangNet Fastlan, a pre-designed, user-installable cable system that offers the full communications capabilities of WangNet, the company's broadband local area network. The latest WangNet offering eliminates the need for lengthy design and certification procedures. Australian release is expected early in July. Fastlan consists of three modules: Fastlan-A, a broadband radio-frequency amplifier unit; Fastlan-B, a network branch with two coupler boxes that connect to the amplifier unit; and Fastlan-C, a drop cable, with a four-port WangNet multi-user outlet, that connects to a coupler box. The modules will sell for $1610 (Fastlan-A), $570 (Fastlan-B) and $200 (Fastlan-C). An optional enclosure for the amplifier unit will cost $1040.

Further information: Wang Computer Pty Ltd, 51 Berry St, North Sydney, NSW 2060. Telephone: (02) 436 3477.

Enter U504 on Enquiry Card

Anderson Jacobsen full duplex modem.

Wang videotex

WANG has announced that videotex information retrieval and transaction capabilities are available on the Wang Professional Computer. Wang's initial videotex product, costing $410 and available from July in Australia, is the PC Viewdata decoder, a software package that provides access to information encoded in accordance with Prestel Protocol. Similar products supporting NAPLPS, Teletel, and CEPT (developed in West Germany) protocols will be introduced over the next few months. About 2500 videotex frames can be stored on the PC's 10M-byte Winchester disk and more than 300 frames on a diskette. Hard copy with black and white shaded printing can be produced from a locally attached dot-matrix printer.

Further information: Wang Computer Pty Ltd, 10-14 Paul St, Milsons Point, NSW 2061. Tel: (02) 929 5144.

Enter U505 on Enquiry Card

First at 48 bits/sec

ANDERSON Jacobson has introduced the world's first full-duplex, two-wire, 4800 bits/sec modem. The first in the family of high-speed modems, the AJ 4048 is a full duplex, originate/auto-answer modem for communications at 4800 bits/sec over dial-up or two-wire unconditional leased lines. It eliminates the need for costly dedicated lines in many applications and doubles the data throughput in others. Full duplex, 2400 bits/sec fallback speed is standard. Complete local and remote diagnostics are a feature. Other features include selectable synchronous or asynchronous operation, extensive frontpanel display indicators and modem membrane front switches. The unit is available for either stand-alone or rack-mounted applications.

Further information: Mostyn Enterprises Pty Ltd, 35 Alexander St, Dundas, NSW. Tel: (02) 871 6297.

Enter U506 on Enquiry Card

Videotex manual

PAUL Budde Communication has issued Australia's first standard work on videotex. About 10 different videotex systems are used in Australia and about 30 information providers supply slightly more than 1000 videotex users. After a study lasting almost two years, the 130-page manual covers general videotex information, videotex searchways, interactive functions, the database and parties involved, technical aspect of videotex, videotex edit systems, videotex standards (rules and suggestions), database management, database layout, key words, testing and controlling the database, documentation, visual presentation and graphic design, the editorial formula, videotex housestyle, videotex forms, follow-up of interactive services and database design and exercises. The manual costs $98.

Further information: Paul Budde Communication Pty Ltd, Freepost 127, PO Box 372, Roseville, NSW 2069. Tel: (02) 411 4442.

Enter U507 on Enquiry Card

Prentice Popcom

PRENTICE Corp has released the Popcom Model C100 modem card, an advanced-design 1200 bits/sec auto-dialing card for the IBM PC, XT, Portable and IBM slot-compatible machines. The C100 modem utilises two custom CMOS integrated circuits to achieve full duplex AT&T 212 compatible operation, tone sensing and voice/data control. The C100 consumes less than one watt of power. The card measures 12.4in x 4.2in x .575in and utilises one slot. Full call progress tone sensing of dial tone, busy tone, remote ring, and voice is implemented by a switchable 20-pole filter to provide tone sensing accuracy. Taking advantage of a similar feature with the Model X100, Popcom C100 is the first modem card product to sense when the local telephone handset is lifted. With this capability, the C100 switches between voice and data operation — even on the same telephone call. This function eliminates the need for a separate telephone line for data use. Prentice also manufactures the Popcom X100 introduced in January. The X100 is a stand-alone modem incorporating many of the same technological advances and user-oriented features as the C100. Production deliveries of the Model C100 are expected to start within a month. The C100 modem card will sell for about $US450.

Further information: Prentice Corp, 266 Caspian Dr. Sunnyvale, CA, USA. Tel: 408 734 9810.

Enter U562 on Enquiry Card

Control Data Introduces StorageMaster Flexible Media.

A lot of companies make diskettes. But Control Data also makes disk drives. In fact, we're the leading independent supplier of disk drives to computer manufacturers.

Now we've put our expertise into a truly superior line: StorageMaster diskettes from Control Data.

You can choose from a complete line of premium 8″ and 5.25″ diskettes in single or double densities, single or double sided. And each diskette is 100% certified and backed by a 5 year warranty. So you can depend on them to perform for years to come. StorageMaster diskettes are made in Australia to meet your exacting demands. Look for StorageMaster diskettes at your local computer store or ask for them from your computer supplies distributor.

Or contact us for information on where you can find StorageMaster diskettes. Melbourne: (03) 555-9911, Sydney: (02) 923-9000, Brisbane: (07) 224-9711 (Dataset), Adelaide: (08) 332-5077, Perth: (09) 367-6777, Hobart: (002) 23-7727, Newcastle: (049) 26-1433, Wellington: (4) 857-686 or 726-745, Auckland: (9) 795-561 or 504-419, Christchurch: (3) 69-170.

CONTROL
DATA

Enter U043 on Enquiry Card

SOFTWARE

Vertical markets

MCS Microcomputer Systems has released three new vertical market software packages designed for video rental libraries, electrical appliance rental companies and clubs and associations with membership records. They were developed in conjunction with the various industries, and are written in mBasic so they will run under CP/M-86 or MS-DOS operating systems on virtually any computer with adequate storage.

Further information: MCS Microcomputer Systems, 502 Miller St, Nth Sydney 2060. Telephone: (02) 923 1373.

Enter U541 on Enquiry Card

Unlimited duplicates

A PASCAL compiler package which allows educational institutions unlimited software duplication privileges within a single campus is being offered in the US by Borland International for $US795. The Turbo Pascal Educational Package includes one floppy disk containing Borland's Turbo Pascal compiler/editor combination, which can run on any Z80 or 8088/8086-based microcomputer. Any school buying the package may copy the disk as often as needed for use within the school. The package also includes 15 Turbo Pascal user manuals, with additional manuals available for $US15 each.

Further information: Borland International, 4113 Scotts Valley Drive, Scotts Valley, California 95066, USA.

Enter U542 on Enquiry Card

Abraxas series

COMPUTER Classics has announced the release of Abraxas Software's database management series for the Commodore 64 personal computer. The series consists of eight packages containing a program disk and one of eight user manuals. There are two basic parts to each program, including a file processor and a word processor.

Further information: Computer Classics, 286 Pacific Highway, Nth Sydney 2060. Telephone: (02) 438 4866.

Enter U543 on Enquiry Card

Portable WordStar

MICROPRO has released a line of "diskless" software products called Portable WordStar, Portable Calc and Portable Scheduler. Currently offered only with the Epson PX-8 lap computer, all are available in the English, French and German languages.

Further information: MicroPro International Corp, 33 San Pablo Ave, San Rafael, CA 94903, USA.

Enter U544 on Enquiry Card

Turbo Pascal compiler is available for educational institutions.

Import/Export

SPSS Inc will display the new SPSS/PC Information Analysis System for the IBM PC XT at the Clapp & Poliak Info Software Show to be held from June 12-14 in Chicago. SPSS/PC provides flexible data transformations, such as the ability to compute new variables or transform the values of existing variables, or compute conditional data transformations contingent on logical conditions found in the data. Data can be entered in several ways: as raw data, as a matrix or as a portable import/export file. SPSS/PC reads data from a self-documenting import/export file made by either SPSS/PC or SPSS-X, an information analysis system that runs on most superminis and mainframes.

Further information: SPSS Inc, 444 N. Michigan Ave, Chicago, Illinois 60611, USA.

Enter U545 on Enquiry Card

SmartKey

SMARTKEY II, a new release of the keyboard enhancer program has been announced by FBN Software. SmartKey is an operating system extension which remains in memory while other software is running. The program allows any of the keys to be redefined to produce a character string of any length with a single keystroke. Typical applications include simplifying the commands of other software, recalling common words and phrases with a single keystroke, adding "boilerplate" letters and contracts and standardising the keyboard layouts of different machines. The program can be used to transform a QWERTY keyboard to the Dvorak layout. SmartKey II is compatible with all popular application programs such as WordStar, dBase II, Perfect Writer, Multiplan and Lotus 1-2-3. It is available in both 8- and 16-bit versions for machines running CP/M, MS-DOS, PC-DOS or CP/M-86. It costs $69 plus tax.

Further information: FBN Software, 16 Coles Place, Torrens, ACT 2607. Tel: (062) 86 1102.

Enter U546 on Enquiry Card

Universe plus

AED Computers has introduced a new operating system for the Universe Supercomputer. The operating system referred to as MP/M 8/16 Plus is, according to AED, an extremely flexible and fast operating system for single-user multi-tasking or multi-user multi-tasking applications. The system offers compatibility with both 8-bit CP/M software and 16-bit CP/M-86 software and can run both types at the same time. The system also offers concurrency which means that a number of 8- and 16-bit programs can be run, controlled and monitored from the one terminal in any mix (this is the first example of the concurrency concept in a multi-user system).

Further information: AED Computers Pty Ltd, 24 Darcy St, Parramatta, NSW 2150. Tel: (02) 689 1744.

Enter U547 on Enquiry Card

Spare tyres

TOMAS Systems has released Moto-Trader, a package of six software modules designed for the motor vehicle trade. Designed by Sky Systems Pty Ltd, Moto-Trader runs on the Seiko 8600 computer. The modules are Spare Parts, Workshop, Sales (floorplan), Debtors, Creditors and General Ledger. Each module can be bought separately.

Further information: Tomas Systems, 30 Whiting St, Artarmon, NSW, 2064. Tel: (02) 438 4233.

Enter U548 on Enquiry Card

Decision Analyst

SOFTWARE City has released Decision Analyst for most 8- and 16-bit microcomputers. Designed by Executive Software, Decision Analyst complements Plan 80 and Ready Writer. Plan 80 is a financial spreadsheet, while Ready Writer is a word processing package which gives most of the features of WordStar.

Further information: Software City, 1/27 Forge St, Blacktown, NSW 2148. Tel : (02) 621 4242.

Enter U549 on Enquiry Card

Turnkey color

TEKTRONIX Australia has announced two new systems: the 856140 and the V-Series. The 856140 systems are turnkey color development systems packaged for 8-bit support. This package offers significant savings in building up a custom system for 8- or 16-bit designs. The V-Series are packaged 16-bit systems geared to the Dec-Vax environment. Tektronix now offers complete software and hardware development tools for the Vax environment for a number of microprocessors. Several new emulators have been added to bring the total of supported chips to 35. Tektronix has also announced another joint marketing agreement for microprocessor development tools. Caine, Farber, Gordon will supply PLM compilers for the 8085-85, Z80/NSC-800 processor.

Further information: Tektronix Aust Pty Ltd, 80 Waterloo Rd, Nth Ryde, NSW 2113. Telephone: (02) 888 7066.

Enter U550 on Enquiry Card

Baby Blue

STRATEGIC Information Systems has announced the release of Baby/34, a software system that enhances the IBM PC and XT to System 34 standard. The system enables PCs or XTs to run or develop RPGII programs, while also using standard PC-DOS features.

Further information: Strategic Information Systems, 150 Albert Rd, Sth Melbourne 3205. Tel: (03) 690 3499.

Enter U551 on Enquiry Card

Weather report

THE new HAWS (Home Automatic Weather Station) from Vaisala, designed for use with Commodore 64 and Vic 20 computers, combines a weather sensor with a package that teaches, forecasts, and graphically displays weather. HAWS uses the same weather sensor used by weather services in 60 countries. It also represents the first personal computer application using an external sensing device, allowing the user to interact and analyse input which is not contained in his computer or the software itself. HAWS allows the user to monitor weather conditions inside or outside the home, as well as allowing the user to interact with the software program to help predict and cope with changing weather conditions. HAWS even allows the user to rate his/her forecasting performance against the local weatherman's predictions.

Further information: Vaisala Inc, 2 Tower Office Park, Woburn, MA 01801, USA.

Enter U552 on Enquiry Card

Apple packages

NETCOMM has upgraded a number of available software program levels. The new levels apply to Apple *II+*, *IIe* and *III* packages. For *II+* and *IIe*, they are 3270 (Version 2.80), 2780 (Version 2.87), 3780 (Version 2.87) and VT52 (Version 2.20). For the Apple *III* they are 3270 (Version 2.76), 2780 (Version 2.81) and 3780 (Version 2.83). Upgrades cost $25.

Further information: NetComm (Aust) Pty Ltd, 8/33 Ryde Rd, Pymble, NSW 2073. Telephone: (02) 498 5577.

Enter U553 on Enquiry Card

Design kit

TECHNICAL Imports Australia has announced the release of the Microwave Design Kit, a microwave circuit synthesis program. The kit allows the design of narrowband and broadband microwave amplifiers. The amplifiers can be single or multi-stage and can be designed for low noise, high gain or high power. The software package recognises unconditionally stable transistors and potentially unstable devices and uses necessary matching to provide unconditioned stability over the entire frequency range. The computer program then calculates the necessary transmission lines both in electrical and mechanical dimensions based on the relative dielectric constant of the material. In the case of multistage configurations, the transformation will be automatically adjusted.

Further information: Technical Imports Aust, Suite 607, 200 Pacific Highway, Crows Nest, NSW 2065. Tel: (02) 922 6833.

Enter U554 on Enquiry Card

Brain power

A COMPUTER software network, designed to resemble the intelligent functioning of the human brain, is being developed by a Sydney computer sciences company, Kingdom Pty Ltd, and will soon be making its international debut. The System, named Orion, could open up new areas which conventional programming will never reach and may shatter traditional research and computation methods. The research program was recognised by the Australian Industrial Research and Development Incentives Board, which approved a development grant of $85,000 last October. The Orion concept was originally discovered by another Sydney company, Interactive Engineering Pty Ltd, which has contracted with Kingdom to complete the development process to the marketing stage based on the Hewlett-Packard range of computers.

Further information: Hewlett-Packard Australia Ltd, 17 Talevera Rd, Nth Ryde, NSW 2113. Tel: (02) 887 1611.

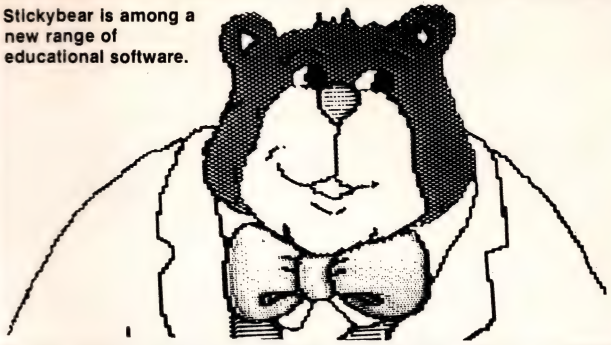
Enter U555 on Enquiry Card

Wordcraft WP

PERSONAL Computer Services has announced the release of a new version of the Wordcraft word processing package from Dataview Ltd (UK), for the IBM PC XT, running under PC-DOS. As well as database, spelling checker, text communications and direct mailing capability, the system now includes a full function calculator to perform calculations on figures held in text as well as automatic row and column arithmetic. The system can also read and edit files from other systems, for example WordStar, MailMerge and Multiplan.

Further information: Padmede Commercial Systems, 26 Ridge St, Nth Sydney 2060. Telephone: (02) 923 2899.

Enter U556 on Enquiry Card



Stickybear is among a new range of educational software.

Stickybear ABC

A NEW range of Apple educational software is available in Australia through Systems Peripherals. Designed for children aged three to six, the programs are called Stickybear ABC, Numbers, Shapes and Opposites. Stickybear is part of a new range from Xerox Education Publications. Each program retails for $49.95 except Chivalry, which is $59.95. Other programs for children aged between eight and 11 are planned.

Further information: Systems Peripherals, 210 Parramatta Rd, Stanmore, NSW 2048. Tel: (02) 568 3790.

Enter U557 on Enquiry Card

Page Planner

PAGE Planner, a new concept in typography, is now available for the IBM PCs and most popular 8-bit microcomputers running CP/M with Z80 microprocessors. The entire typesetting process — from entering the raw copy to making up the complete page — is simplified with a software program now available from Davey Graphics. Those who do not have a suitable microcomputer can lease, rent or buy one from Davey Graphics and any competent typist can use the software as a complete front-end system. A minimal configuration of 64K-bytes of RAM and 2 x 300K-bytes of floppy disk capacity are required. Winchester disks and/or extra floppy disk drives are supported in any mix, up to a maximum of four drives. Davey Graphics can interface most micros to any Meganthaler or AM photosetter capable of reverse leading, and Compugraphic 8200, 8400 and 8600 phototypesetter.

Further information: Davey Graphics Pty Ltd, 12-16 Regent St, Prahran, Vic 3181. Telephone: (03) 51 9842.

Enter U558 on Enquiry Card

Medical Bombs

MAI Australia has announced the release of Bombs (Basic Orientated Medical Business System), a software package designed for medical practitioners. Bombs handles all financial aspects of a medical surgery, along with personal and family medical history files, X-ray result files, medication profiles and printed medical database management.

Further information: MAI Australia Information Systems, 20 Clarke St, Crows Nest, NSW 2065. Tel: (02) 438 2455.

Enter U559 on Enquiry Card

VideoMinder

CUSTOMSOFT Developments has announced VideoMinder, a video library management system and multi-user accounting and business management packages. All packages run on TurboDOS-80. VideoMinder features include support for up to nine different types of membership or casual categories and up to nine different types of tapes, an automatic pricing mechanism, comprehensive management reporting, including tape and member profitability listings. The system incorporates tight overdue control and reporting, extremely high speed (transactions completed in less than five seconds) and keeps track of all tape stock, distinguishing between ordinary tapes, rental tapes, new releases and "specials", and calculates prices accordingly.

Further information: CustomSoft Developments Pty Ltd, PO Box 184, Wahroonga, NSW 2076. Tel: (02) 48 1880.

Enter U560 on Enquiry Card

ImagiX expansion

IMAGITEX Inc of the US has announced ImagiX, an expanded set of software and hardware features for its black and white image processing subsystem. ImagiX, running in a 68000 and UNOS operating environment, is a complete image processing package that includes digital image processing features previously offered and now includes post-processing and data formatting functions for the Information International Comp 80 and VideoComp products, as well as the Monotype Laser-comp Mark II.

Further information: ImagiTex Inc, 77 Northeastern Blvd, Nashua, NH, 03062 USA.

Enter U561 on Enquiry Card

EDUCATION

Syme micro course

MELBOURNE's Chisholm Institute of Technology has bought 17 IBM PCs for its school of computing and information systems, while its David Syme Business School has chosen 12 Nec Advanced Personal Computers. Both schools will include microcomputer elements in their regular courses as well as running short courses in micro applications for both beginners and advanced students. The school of computing and information systems is so convinced of the future of microcomputers in business and industry that a microcomputing hardware/software unit will be mandatory from now on in the Bachelor of Applied Science (Computing) course at Chisholm. Post-grad courses using the IBM PCs will concentrate on expert systems, database management, decision support systems and micro-to-micro and micro-to-mainframe communications.

Further information: Chisholm Institute of Technology, 900 Dandenong Rd, Caulfield East, Vic, 3145. Tel: (03) 573 2222.

Enter U586 on Enquiry Card

Keyboard courses

SYDNEY'S Metropolitan Business College has launched a series of courses specifically designed to provide keyboard skills to executives. The college has structured the Executive Keyboard Course to fit in with the busy schedules of professionals and managers. The course will run over five consecutive mornings from 8 to 10 am or, alternatively, five afternoons from 4 to 6 pm.

Further information: Metropolitan Business College, 50 Bridge St, Sydney 2000. Tel: (02) 232 7666.

Enter U592 on Enquiry Card

School computers

TOSHIBA will supply microcomputers to the SA Institute of Technology for use in applications ranging from accounting to civil engineering. Toshiba's T300 system was selected following an extensive evaluation during which academic staff were invited to examine and test 14 popular micros. About 40 16-bit Toshiba T300 systems have been installed in classrooms at the Institute while orders from individual academic staff account for a further 10 machines. The Institute will gain support through Toshiba's South Australian agent, General Business Machines Pty Ltd of Hackney. The machines are the first volume purchase of microcomputers by the Institute. The move resulted from initiatives by the School of Accounting and several engineering schools coordinated by the Academic Computing Board whose charter is to formulate policy for academic computing in the Institute.

Further information: Toshiba (Australia) Pty Ltd, 84-92 Talavera Road, North Ryde 2113. Tel: (02) 887 3322.

Enter U593 on Enquiry Card

Intensive hands on

SOFTWARE Corp of Australia, through its new SCA Institute division, has developed an intensive hands-on seminar called Using MultiMate. Conducted initially in Melbourne (then in other centres) on a monthly basis, Using MultiMate was developed in conjunction with Dr Peter Salmon, one of Australia's most experienced and respected practitioners in the area of computer education. It takes the first-time user on a guided tour of MultiMate's features and gives programmed instruction in MultiMate's word processing features. Participants have the use of an IBM PC for the duration of the seminar as well as the latest version of MultiMate — currently Version 3.22. Each seminar runs for 1½ days. The first Using MultiMate seminar was held in Melbourne on April 30 and May 1. A detailed brochure is available from Software Corp of Australia or from MultiMate dealers.

Further information: Software Corp of Australia Pty Ltd, 449 Swanston St, Melbourne 3000. Tel: (03) 347 7011.

Enter U594 on Enquiry Card

Active learning

ACTIVE Learning Systems has launched the first of a series of products onto the Australian educational software market. One World is a database on all the nations of the world and is meant initially to be used in geography, social studies, history and current affairs studies, but is also designed to develop analytical and computer skills. One World contains information under 33 categories on all of the 178 independent nations of the world as of January 1984. There are 178 individual country records in the database, with information ranging from politics, physical geography, population to economy, but it is meant to do more than supply information about particular countries or regions of the world. Active Learning Systems will soon release three more educational software packages based on a similar format of information, analysis and computer skills. Australia: A Profile is a database on regions of Australia.

Further information: Active Learning Systems, 307 Queen St, Brisbane, Qld. 4000. Telephone: (07) 221 9823.

Enter U595 on Enquiry Card

Computer Tutor

COMPUTER Tutor, a company started recently by two Sydney educational psychologists has released its first educational software program, Basic Arithmetic and Algebra. The second, English: Sentence Construction, is scheduled for release about now. The software is designed for use on a Commodore 64 or SX-64. Content on the tapes or disks is geared to the NSW HSC syllabus for Year 11 and 12 students. The learning principles are the Skinnerian principles plus advances in this field over the past 50 years. The company plans to cover all the subjects of the NSW HSC syllabus inside the next two years. Computer Tutor programs are being distributed through Ozi-Soft.

Further information: Computer Tutor, Suite 5, 191 Victoria Rd, Gladesville, NSW 2111. Telephone: (02) 816 3178.

Enter U598 on Enquiry Card

Video series

VIDISTRIB Australia has released Understanding Personal Computers, a series of video computer manuals designed to explain the make-up and workings of home computers. The initial cassette releases cover an introduction to personal computers, hardware, software, printers and word processing.

Further information: Vidistrib Australia, 365 Concord Rd, Concord West, NSW 2138. Telephone: (02) 73 1247.

Enter U599 on Enquiry Card

Grants applications

THE Australian Apple Foundation has been launched. Grants will be limited to the supply of hardware for work in the development and application of learning relevant to computer-based teaching/learning systems. Applications will be considered in either project work or software development. Development of the project need not have commenced and there is no need to provide any details of proposals at the initial stage.

Further information: Apple Education Foundation, PO Box 371, Nth Ryde, NSW 2113.

Enter U600 on Enquiry Card

EVENTS

Nec users

A GROUP has been set up in Melbourne for users of the Nec 8201A portable computer. Called the Nec Portable User's Group, it meets on the second Wednesday of the month at Myer Computer Centre, Lonsdale Street at 7.30pm. The group hopes to cater for all levels of interest from raw beginner to business user to advanced hardware and software buff.

Further information: D Green, (president) Tel: (03) 611 3380. M Truman (secretary). Tel: (03) 605 4509 business hrs.

Enter U596 on Enquiry Card

Melbourne show

PC84 will be staged at the World Trade Centre, Melbourne, on July 18-21. PC85 will be at Sydney's Centrepoint on March 13-16 next year. Organisers say more exhibitors plan to show equipment and the show will occupy more space than previous shows.

Further information: Australian Exhibition Services, Suite 3-2 Lloura Plaza, 422 St Kilda Rd, Melbourne 3004. Telephone: (03) 267 4500.

China's computers

COMPUTER China '84, scheduled to be held from November 25 to December 1, in Xiamen Special Economic Zone, of the People's Republic of China, is organised by the Fujian Consultancy Centre for Science and Technology, the China Council for the Promotion of International Trade, the Fujian Sub-council and Xiamen Special Economic Zone Construction and Development Co. The exhibition will coincide with the Second Academic Conference organised by the China Microcomputer Applications Association. Exhibits will cover the full range of computer systems, components and devices, Chinese data systems, Chinese character terminals, data management systems, communications networking technology, intelligent instruments, meters and transducers, components and devices, various computer interfacing technology, industrial process control and robots, various computer software, databases and exhibits of available computer magazines, books and technical information.

INDUSTRY

Selling rights

MAZDA Sales Pty Ltd of Australia and MDS Qantel (Aust) Pty Ltd have bought the rights to sell the CCL-developed software package known as CAMS (Computerised Automotive Systems) to the Australian automotive industry. Development of CAMS began 18 months ago when motor vehicle dealers in New Zealand began to acknowledge the need to computerise stock control, general ledger, debtors, parts inventory, invoicing, hire purchase, costing and other functions.

Further information: MDS Qantel (Aust) Pty Ltd, 169 Miller St, Nth Sydney 2060. Telephone: (02) 922 4933.

Enter U569 on Enquiry Card

Price cutting

TOSHIBA has cut the price of the P1350 multi-code printer by 15 per cent. The $500 cut means a P1350 released in Australia just over a year ago is now priced at $2650 including tax.

Further information: Toshiba (Australia) Pty Ltd, 84-92 Talavera Rd, Nth Ryde, NSW 2113. Tel: (02) 887 3322.

Enter U570 on Enquiry Card

Nashua pushing

NASHUA will promote a new brand awareness campaign for its diskette products based on the company's new multi-colored spinning disk logo. Countertop displays are a feature of the campaign together with a full color advertising program aimed at lifting market share. Nashua will also be promoting the Data Converter, a machine used for disk formatting, copying and data transfers, and which will be used to equip service centres being planned throughout Australia, New Zealand and the South Pacific because of an exclusive agreement with Blue Sky Industries Pty Ltd, a Sydney computer manufacturer.

Further information: Nashua Australia Pty Ltd, 34 Chandos St, St Leonards, NSW 2065. Tel: (02) 925 3111.

Enter U571 on Enquiry Card

Dealer support

APPLE Computer Australia has appointed Mitchell Chapman as northern region sales representative responsible for dealer support in Sydney's northern suburbs and Newcastle. Chapman was previously employed as a marketing representative for IBM, responsible for office equipment and office automation sales in North Sydney. He studied computer science at Sydney University.

Further information: Apple Computer Australia Pty Ltd, 37 Waterloo Rd, Nth Ryde, NSW 2113. Tel: (02) 888 5888.

Dolphin range

DOLPHIN Computers is now distributing a range of software and hardware enhancements from Currah Computer Components, Bug Byte Software, Fuller MicroSystems, Stonechip Electronics, Tasman and Ultimate Software. For the Commodore Vic 20, the hardware range covers speech synthesisers, memory expanders, switchable motherboards, and light pens. For the Sinclair Spectrum, the hardware range covers professional keyboards, speech synthesisers, programmable joystick interfaces, sound amplifiers and generators, memory expanders, and serial and parallel printer interfaces. A similar range is available for the Sinclair ZX81. UK games include The Birds & The Bees, Twin Kingdom Valley, and Lunar Jet Man.

Further information: Dolphin Computers Pty Ltd, 99 Reserve Rd, Artarmon, NSW 2064. Tel: (02) 438 4933.

Enter U573 on Enquiry Card

Sofco programmers

QUEENSLAND computer language designer Sofco Pty Ltd has appointed three more programmers to its staff. They are Jeff O'Mara (commercial programmer), Anne-Marie Derrington (design programmer) and Angela Heal (systems programmer). Sofco is due to release their dBasic database language in July.

Further information: Sofco Pty Ltd, Suite 10, 225 Hawken Dr, St Lucia, Qld 4067. Tel: (07) 371 7200.

Enter U574 on Enquiry Card

Future assured

MICROSOFT Corp and Digital Equipment Corp have signed an agreement which will assure that future Microsoft system and application software will be available for Digital's Rainbow series of PCs. Under the multi-year, multi-million dollar agreement, Digital will acquire licensing rights to Microsoft software including the MS-DOS operating system and will manufacture, distribute and market it through its Digital Classified Software program. Microsoft will make available software development kits for independent small producers for the Rainbow series software.

Further information: Microsoft Pty Ltd, PO Box 98, Terrey Hills, NSW 2064. Tel: (02) 450 2522.

Enter U575 on Enquiry Card

Library Sequel

THE Australian National University has contracted with AWA Computers for the supply of the Urica Library software system and network. The final system configuration is expected to consist of an AWA Sequel computer with 1G-byte of disk memory and 80 terminals. The contract followed a detailed evaluation of Australian and overseas library systems by senior library staff, computer services staff and academics representing the University's computing policy committee. The final short list consisted of two North American systems and the AWA Urica system. The AWA Urica software is largely Australian developed and will run on the Sequel computer produced by Microdata, a subsidiary of McDonnell Douglas, in the US.

Typewriter awards

OLYMPIA Australia awarded an ES100 electronic typewriter to the 1984 Secretary of the Year, Carmel Grey. It also awarded a Compact electronic typewriter to the winner of its Secretaries' Week speed and accuracy competition, Deborah Castelli. The awards were made at an official ceremony at Olympia's Artarmon headquarters on April 10. Grey is secretary to Gordon Swan, deputy chief executive of the NRMA, while Castelli is a word processor operator for Hawkesbury Shire Council.

Terminal order

STANDARD Chartered Finance has ordered 40 T4000 terminals from Time Office Computers for its Honeywell mainframe. The order is worth about $100,000. The terminals will be installed throughout Australia and will communicate with the mainframe in Sydney.

Further information: Time Office Computers, 99 Mount St, Nth Sydney 2060. Tel: 436 3333.

Enter U576 on Enquiry Card

Sourceware jobs

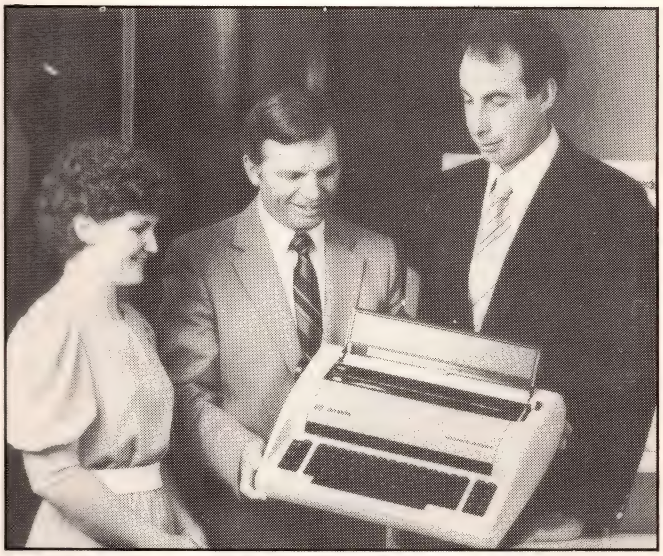
NORMAN Way has been appointed a senior support consultant with Sydney computer products distributor Sourceware Pty Ltd. John Corley has been appointed a technical consultant. Both Way and Corley have joined the online software division.

Tassy Mitsui

MITSUI Computer Systems has appointed its first Tasmanian dealer. The Computer Place, 322 Hobart Rd, Launceston, will sell the complete range of Sord computers, marketed by Mitsui, and will specialise in business software packages geared to word processing, data management and accounting.

Cable contract

HEWLETT-Packard Australia has signed a contract for local manufacturer Data Cable Pty Ltd to supply a range of interconnecting, high-technology data cable assemblies. The cables, used to connect all HP computers to HP's equipment range including instrumentation, terminals, printers, analytical and medical equipment, will be distributed to HP customers throughout the Pacific Basin.



Deborah Castelli, winner of the Secretaries Week speed and accuracy typing competition, receives an Olympia compact typewriter from company representatives.

INDUSTRY

Select marketing director Rod Cuthbert (left) discusses the dealership agreement with Hewlett-Packard Australasian sales manager John Deftereos.

Select agreement

HEWLETT-Packard Australia has completed a dealership agreement for Select Microsystems Pty Ltd to distribute HP personal computers, plotters and ancillary equipment. Select, 20 per cent owned by BLE Capital, Westpac's venture capital group, specialises in sales of personal computers to the commercial and government sectors.

Further information: Hewlett-Packard Australia Ltd, 31-41 Joseph St, Blackburn, Vic 3130. Tel: (03) 895 2895.

Enter U577 on Enquiry Card

Apple share

APPLE Computer and Sony Corp have agreed to share existing research on hard disk technology. Under terms of the agreement, Apple will provide Sony with existing research on hard disk technology, enabling Sony to expand its product line of computer peripheral devices for the OEM (original equipment manufacturers) market. Sony supplies Apple with the 3½in micro floppy disk drives for use with its Macintosh and Lisa 2 personal computers.

Clearinghouse

THE Royal Melbourne Institute of Technology has attracted 16 international and local computer companies and peripheral suppliers to its Australian Microcomputer Industry Clearinghouse which opened recently. A new concept in Australia, the clearinghouse offers microcomputer owners, operators, and potential users a range of services including access to hardware and software for personal evaluation, either in a self-learning mode or with demonstrator assistance. A variety of short training programs is also offered.

Further information: Australian Microcomputer Industry Clearinghouse, 459 Swanston St, Melbourne 3000. Tel: (03) 348 1775.

Enter U578 on Enquiry Card

Teachers' Apples

A SPECIAL teachers' purchase plan announced by Apple Computer early last December has proven successful. Apple says more than 200 Apple *IIe* starter systems were sold to Australian teachers under the scheme within the first three weeks. Priced at $1840 (with tax exemption) the starter system includes an Apple *IIe* 64K-byte computer, monitor 80-col text card and disk drive with controller.

Further information: Apple Computer Australia, 32 Waterloo Rd, Nth Ryde, NSW, 2113. Tel: (02) 241 2016.

Enter U589 on Enquiry Card

Support expansion

THE Computer Co — the Singer (Australia) Pty Ltd division handling the Australian distribution of the Panasonic JB 3000 — has announced an expansion of the software support developed for its computer. Recent developments have included more than 20 packages designed for important vertical markets, including medical, legal, membership, graphics applications as well as nine accounting packages.

Further information: The Computer Co Pty Ltd, 369-385 Wattle St, Broadway, NSW 2007. Tel: (02) 20951.

Enter U580 on Enquiry Card

DBS-16 upgrades

COMPUTER Enterprises has announced enhancements to its DBS-16 supermicrocomputer range. An upgraded DBS-16 will now support up to 28 users simultaneously. The DBS-16 is based on the Intel 80186 16-bit processor and can be configured with 256K-bytes to 3.58M-bytes of RAM.

Further information: Computer Enterprises Pty Ltd, 4 Help St, Chatswood, NSW 2067. Tel: (02) 419 8577.

Enter U581 on Enquiry Card

Datascape deal

DATASCAPE has been appointed Australia-wide distributor for the Nec range of word processing and dot-matrix printers. Datascape has been selling Nec printers (Spinwriters) in Australia for more than a year. Sales worth more than $500,000 have been made in the past six months with major contracts to Goodyear Pty Ltd and the University of New England. The agreement allows Datascape to offer the complete range of Nec printers, including the new P2/P3 series of dot-matrix units. Datascape has established an Australia-wide service network to support Nec sales, and recently sent marketing director Stephen Chapman to Japan to discuss pending Nec releases.

Further information: Datascape, 44 Avenue Rd, Mosman, NSW. Tel: (02) 969 2699.

Enter U582 on Enquiry Card

Competron moves

THE retail division of Archive Computer Services, of Brisbane, has moved to its own premises under the name of Competron Computer Solutions. Competron carries a wide range of microcomputers and distributes software to 500 dealers in Australia through its wholesale division, Arcom Pacific.

Further information: Competron Computer Solutions, 252 Abbotsford Road, Mayne, Qld 4006. Tel: (07) 52 9700.

Enter U583 on Enquiry Card

Mercedes GL Plus

FOLLOWING a four-month evaluation of general ledger packages, Mercedes-Benz (Australia) Pty Ltd has signed for GL Plus from McCormack & Dodge Australia. The package is being installed on Mercedes-Benz's Facom mainframe computer running in an F4 environment at the head office, in the outer Melbourne suburb of Mulgrave.

Cashed-up Apple

APPLE Computer reported net earnings for the three months to March 30 fell from $US23.9 million to $US9.1 million, while sales rose 32 per cent from $US228 million to $US300.1 million The company ended the quarter with $US203.4 million cash and short-term cash investments and shareholders' equity of $US401.5 million.

Customs clearance

THE John G. Stephenson Group has acquired the Tony Graham Customs Agency, of Sydney, which specialises in the customs clearance of computer equipment. Tony Graham, the previous owner of the company, will join the group as manager of its computer clearance operations.

Cataloguing crabs

ADLER Business Machines has donated an Alphatronic P2 computer to the Australian Museum. The microcomputer has been installed in the crustacean department for use in cataloguing both past and current species. More than 30,000 crustacean records dating back to the 1880s will be put on floppy disk for filing.

Management prizes

DIGITAL Equipment Corp has announced it will supply three computer systems with application software packages as prizes in The Australian Financial Review Management Game. As well as cash prizes totalling $11,600, the first three place-getters will receive Digital computer systems worth about $36,000. These include a Professional 350 PC as first prize, a Rainbow Plus PC as second, and a Rainbow 100 as third prize.

Song and dance

HEWLETT-Packard sponsored the world premiere season of a Melbourne Theatre Co production Carmen . . . Another Perspective, starring Jeannie Lewis. The season ran from April 12 to May 26.

Special recognition

VERBATIM has announced that, of all its plants worldwide, the Australian factory has the highest standard production quality control. There are seven Verbatim manufacturing plants around the world, but the Melbourne plant received special recognition for its low return rate, less than 0.01 per cent.

Crafty Canon

"CANON . . . the touch of perfection" is the theme of a series of television advertisements running in all States from mid-April through to mid-November. The Canon commercials directly relate the Japanese master craftsman and his traditional perfectionist skills to Canon's contemporary skills displayed in the company's latest products.

Source codes

PERSONAL Computer Services, the Australian distributor of Padmede software, has bought the source code for all Padmede accounting software from the UK company, making PC independent from UK operations. Padmede has more than 1500 accounting packages installed and will use feedback from these to help with further software developments.

Further information: Padmede Commercial Systems, 26 Ridge St, Nth Sydney 2060. Telephone: (02) 923 2899.

Enter U584 on Enquiry Card

Nec's million

NEC Corporation has announced that domestic shipments of its personal computers had exceeded one million. Nec is planning to build and ship 660,000 personal computers worldwide this year. Nec has been manufacturing personal computers for just over four years and, according to the Japanese publication Nikkei Sangyo, took over 45 per cent of the Japanese market in 1983. The total domestic market in Japan now exceeds one million units a year for personal computers. Nec manufactures its own CPU chips and other components, and is one of the top three integrated circuit manufacturers in the world. Nec Information Systems Australia shipped 4000 personal computers in the financial year ended last March (more than 2000 disk-based PCs and almost 2000 "lap" computers). The company is presently concentrating on the business and corporate markets, and expects to almost double its business for PCs this year.

Further information: Nec Information Systems Australia Pty Ltd, 99 Nicholson St, St Leonards, 2065. Tel: (02) 438 3544.

Enter U585 on Enquiry Card

Filming the new Canon TV commercials.

Thinking about a Multi-User system . . .

Look at an ICL Solution.

If you want software for Sales Accounting

- Medical or Veterinary Applications
- Inventory Control and Order Processing
- Costing
- Financial Modelling
- Word Processing
- Property Management & Trust Accounting
- Insurance Broker Management

Plus up to 8 concurrent uses.

BIG Company backing and Professionals who REALLY understand your business

You should be talking to us

? THINK COMPUTERS
602 Maroondah Hwy, Mitcham, 3132
Telephone: (03) 873 1122
DEALER ENQUIRES WELCOME

ICL PLEASE SEND FURTHER INFORMATION
NAME ....
COMPANY NAME ....
ADDRESS ....
....
P/Code .... PHONE ....

Enter U010 on Enquiry Card

APPLICATIONS

Breaking silence

TWO and a half years of paralysed silence has ended for 29-year-old Marian McKellar, thanks to a Commodore 64 computer. Marian's only actions since being badly injured in a car crash in 1981 have been the faltering movements of her right hand. She can see and hear but can't speak or move any other part of her body. Freelance computer programmer Alan Lawson-Brown became interested in her case and devised a program to let her "talk" with people via the computer. Marian's first message was a plea for her identity as an individual: "My name is Marian spelt with an A". For years, her medical records and name tag had been spelt "Marion". Alan Lawson-Brown's program gives Marian a set of 150 standard statements and questions. Any one of them can be displayed on a television screen by her pressing a maximum of five keys.

Dancing shoes

NATIONAL Small Business Award winner Paul Wright Pty Ltd, of Brisbane, has computerised office procedures using a Commodore with 1M-byte disk drive and a 132-col printer. Paul Wright, which manufactures ballet and ballroom shoes and casual footwear, says the system has helped in costing control. Paul Wright began his business as a hobby while touring with the Australian Ballet. Today his ballet shoes are used by dancers of the New Zealand and Norwegian Ballet Companies and he has made shoes for women in the Queensland, Victorian and ACT police forces.

Video bonanza

COMPUTER Enterprises has sold its first DBS-16 supermicrocomputer in Queensland to Brisbane video hire and sales group Video Vision. A multi-million dollar company, Video Vision has 38 retail outlets in Queensland, and is reputed to buy and sell more video movies and blank tapes than any other video company in Australasia. Founded by former shearer Harley Burke four years ago, the company now has more than 2200 movie titles in stock, and its library has more than 11,000 members in Brisbane and about 4000 more throughout Queensland.

Further information: Computer Enterprises Pty Ltd, 4 Help St, Chatswood, NSW, 2067. Tel: (02) 419 8577.

Enter U587 on Enquiry Card

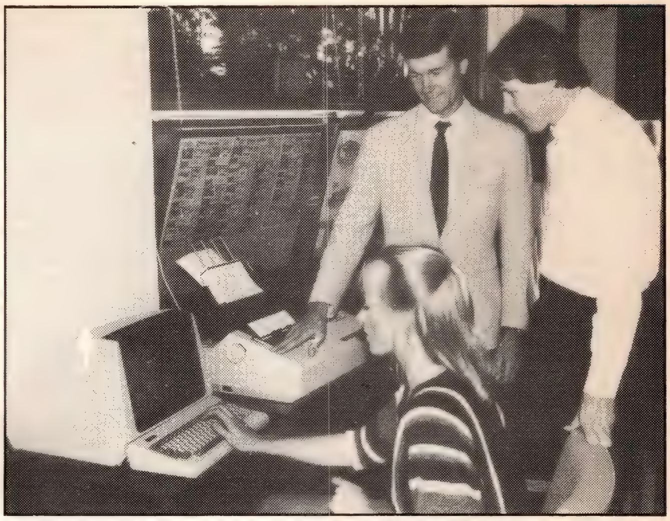
Webster order

WEBSTER Computer has signed up orders totalling $60,000 for two of its locally designed Spectrum Eleven minicomputers for direct inhouse use by major motor vehicle dealers in NSW and Queensland. The deal was organised by Webster's Sydney branch with the Wollongong-based software company Systime Australia Pty Ltd, and despite the generally conceded gloom and slow sales of new cars caused by the recession, more orders for systems are anticipated. They will be marketed by Systime to dealers throughout Australia.

Further information: Webster Computer Corp Pty Ltd, 17 Melvern St, Bayswater, Vic 3153. Tel: (03) 729 8444.

Enter U588 on Enquiry Card

Paul Wright, left, winner of the National Small Business Award.



Office staff use the Cashpac computerised real estate listing.

Property listing

AUSTRALIA's first integrated computer property listing service has been established in Sydney to streamline real estate and property sales operations. The new service, called Cashpac Compulist, is operating on the upper North Shore, and interest from real estate agents throughout the Sydney metropolitan area and even interstate is growing. Compulist, part of the Cashpac organisation, is an independent service, not tied to any real estate group. The computerised listing service is the brainchild of Warren Tucker, who runs Concise Real Estate in Gordon, and has had an extensive background in computers.

Further information: Cashpac Group, 762 Pacific Highway, Gordon, NSW, 2072. Tel: (02) 499 2233.

Enter U589 on Enquiry Card

Fairfax order

NEC Information Systems has received another bulk order for its PC8201A Portable Computer from the John Fairfax & Sons newspaper group for use by their on-road journalists. A total of 55 machines have been sold so far this year to the Fairfax group, including The Age, Sydney Morning Herald, Illawarra Mercury and Newcastle Herald.

Further information: NEC Information Systems Australia Pty Ltd, 99 Nicholson St, St Leonards, NSW 2065. Tel: (02) 438 3544.

Enter U590 on Enquiry Card

Energy control

ST MARGARET's Hospital in Sydney has become the first hospital in NSW to take advantage of the State Department of Health's grant to install a new energy management control system. The hospital's $17,000 W7000 Honeywell computer uses a microprocessor to prevent over paying for electricity. The hospital anticipates recovering the cost of the new equipment within two years.

Further information: St Margaret's Hospital, 435 Bourke St, Darlinghurst, NSW, 2010. Tel: (02) 339 0466.

Cardiac Arrest

THE lives of intensive care patients at Griffith Base Hospital are being safeguarded by a Commodore 64 and a new piece of software called Cardiac Arrest which greatly cuts the delay between the time an emergency happens to the alarm being raised. The program is the brainchild of former hospital engineer Charles O'Brien (now with St Vincents Private Hospital, Sydney) who worked with Wagga programmer Peter Van Eeken. A system of 17 television monitors linked to the Commodore 64 broadcasts alarm calls and locations with a series of different tones to alert staff. The process takes four seconds from the moment a staff member keys in the initial call or an alarm is triggered to a message being flashed onto 17 screens. But the four seconds will be reduced to 1½ seconds when Commodore completes its program.

Organising EDP

THE Australian EDP Auditors Association handed over much of the administrative work of its sixth annual conference — held in Sydney on May 17-19 — to an Apple *IIe* computer. The association says the *IIe* is providing a low-cost filing system and word processor from normal commercial software but the special program written for the conference was designed to allow simple collation of the conference mailing and attendance lists, which was matched with the intended attendance period of each member and fees paid or owing.

DialGuard security

A NEW dial-up security device called DialGuard has been released by Case Communication. The device, which costs $500, has been developed and manufactured in Sydney. DialGuard can store 200 passwords and associated telephone numbers and is expected to be used in applications such as database access, remote data entry, electronic mail, remote program development and fault diagnosis.

Further information: Case Communication Systems Ltd, 1-3 Rodborough Rd, Frenchs Forest, NSW 2086. Tel: (02) 451 6655.

Enter U563 on Enquiry Card

Compact power

SCIENTIFIC Electronics is making and marketing a compact switch mode power supply which is compatible with the IBM PC and provides the extra power needed to convert the PC to an XT version. The XT130AD1 also enables the PC to be converted from 110 volt to 240 volt. Prices fall to about $175 for orders of 100 units or more. The XT130AD1 is a four-rail, 130 Watt unit with a five-year warranty.

Further information: Scientific Electronics, 6 Holloway Drive, Bayswater, Vic 3153. Telephone: (03) 762 5777.

Enter U564 on Enquiry Card

Black Box

THE 1984 edition of the Black Box Catalogue contains 120 pages and more than 300 products. Available from Datacraft, the 1984 edition provides complete data on a broad range of products including modems, data switches, print spoolers, protocol converters, interface converters, junction panels, cables, tools and reference books.

Further information: Datacraft (Aust) Pty Ltd, Maroondah Highway, Croydon, Vic 3136. Tel: (03) 726 9911.

Enter U565 on Enquiry Card

Digital multimeter

JOHN Fluke has released a new systems-oriented digital multimeter which combines superior measurement performance with 5½ digit resolution. Emphasis has been placed on ease of use with a simple front panel, push-button layout. Designated Model 8840A, the new multimeter incorporates self-diagnostics and "closed case" calibration. Typical DC accuracy of the new instrument is 0.002 per cent for 24 hours with 1 microvolt resolution. True RMS AC accuracy is 0.16 per cent for a year with a response extending to 100KHz. Current accuracy is 0.03 per cent DC for a year.

Further information: Elmeasco Instruments Pty Ltd, 15 McDonald St, Mortdale, NSW 2137. Tel: (02) 736 2888.

Enter U566 on Enquiry Card

Indian high tech

ELECTRONIC and computer equipment manufactured in India was displayed in Sydney's International Trade Development Centre on May 22-24. Products from 10 manufacturers were shown. Equipment included computer hardware, software, rigid and floppy disk drives, electronic componentry, silicon semiconductor devices, public address equipment and electronic instruments including line power conditioning and control equipment, radio transmission and defence satellite componentry.

Seeq-ing memories

ECQ Electronics has been appointed Australian distributor for Seeq Technology Inc which manufactures non-volatile reprogrammable memory devices. Founded in January 1981, Seeq is now producing 5-volt 64K-byte, and 128K-byte EPROMS, and will introduce a 256K-byte CMOS EPROM late this year. It also produces E^{2}ROMs (electrical erasable programmable read only memories) which can be erased and reprogrammed using only a 5-volt source and which do not have to be removed from the system.

Further information: ECQ Electronics Pty Ltd, 16 Staple St, Jindalee, Qld. 4074. Telephone: (07) 376 5677.

Enter U567 on Enquiry Card

Award letterheads

CARTER & Taverner Pty Ltd was awarded grand awards in category one and category two of the Australian Business Forms Association awards for 1983. Category one's entry was a letterhead printed for the City of Heidelberg on C&T's A4 Contiprint. Category two's winner was another letterhead on A4 Contiprint for the Shire of Whittlesea. All entries were judged by an independent panel representing the business forms industry.

Further information: L.L. Brown & Associates Pty Ltd, Suite 6, 58 Garden St, South Yarra, Vic 3141. Tel: (03) 241 4371.

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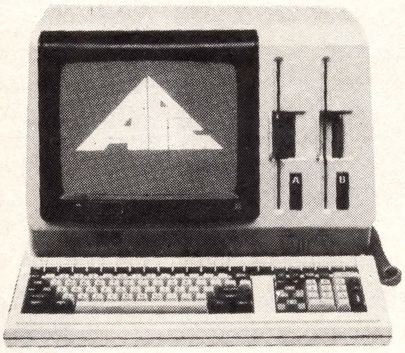

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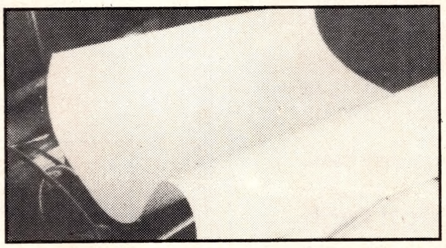
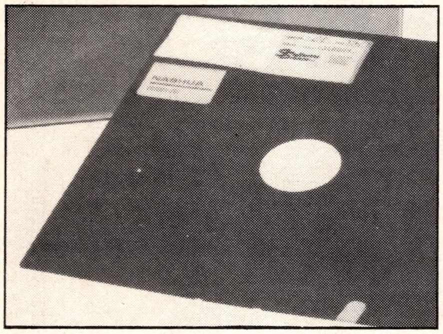
NEXT ISSUE

PAPER AND RIBBONS

Many computer users spend more on paper and ribbons than they do buying their printer, yet little is known about these consumables still dominated by office suppliers. **Neville Angove** *investigates the market.*



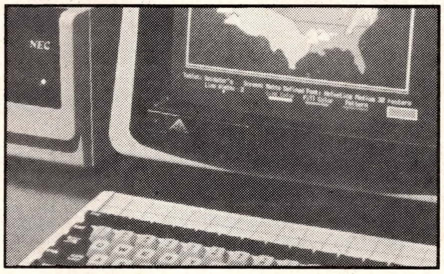


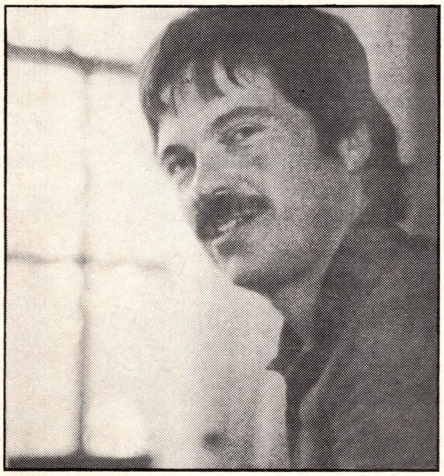
DISKS! DISKS! DISKS!

It seems as though everyone wants to sell their own brand of floppy disks. With several local manufacturing plants and explosive demand, users are confronted with a wide range of brands and prices. **Neville Angove** *details the choices and discusses the care needed if you are using low-torque disk drives.*

NEC AND THE APC

A lot of controversy surrounded **Your Computer's** *1983 award of "Computer of the Year" to the Nec APC. Nec has used its financial and marketing strength to make the APC a success. We re-evaluate the Nec APC and its appeal to Australians.*

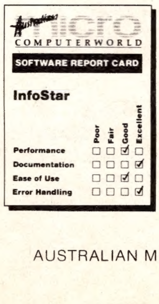




THE MAN MOST LIKELY

Some people regard the gap between the publication of **Alan Kay's** *Dynamic Personal Media and Apple's next computer as an interesting but rather tacky beginning to personal computing. His move from Atari to Apple, as an Apple Fellow, has encouraged Apple watchers who have been doubting whether that company has enough of the right stuff to build the next computer after Macintosh. Tim Bartimo profiles Alan Kay, the man who gave the world the personal computer.*

Due to a printer's error, our review of InfoStar in the May edition of Micro Computerworld unfortunately carried a Report Card duplicated from another review.
Here we publish the correct card and apologise to readers for any inconvenience.



Australian Micro COMPUTERWORLD

SOFTWARE REPORT CARD

InfoStar

	Poor	Fair	Good	Excellent
Performance	☐	☐	☑	☐
Documentation	☐	☐	☐	☑
Ease of Use	☐	☐	☑	☐
Error Handling	☐	☐	☐	☑

AD INDEX

A & M Computer Solutions 51, 53
AB Office Equipment 130
ACT Inside back cover
Adler 9, 88
Anderson Digital Equipment 92, 111
Applied Technology 84, 85
Archives Computers Australia 121
AWA Data Processing 61
Barson Computers 11
BDS 67
Brother Industries 95
Business Scope — Qld 132
Case Communications 126
Caulfield Business Computers 97
Commercial & Professional Micro Systems 138
Compak Computer Shop 37
Computer Classics 41
Computermax 108
Control Data 143
Co-Worker Computers 47
Data Decor 106
Data Peripherals 54, Outside back cover
Datascape 99
Electronic Associates International 96
Electrical Equipment 120
Entercom 151
Fagan Microprocessor Systems 21
Home Computers 138
ICL 133
Imagineering Inside front cover, 50
Insystems 106
JBA Micro 7
Kenelec (Australia) 36
KJ Computer Services 38
Medair 38
Micro EDP & Hardware 90
Micro Nationwide 141
Modem Technology 90
Nashua Australia 15
NEC 105
Osborne 68, 69
Pacific Typewriters 29, 129
Pantek 22
Rexel 117, 125
Roland Corp of Australia 1
Software Corp of Australia 19
Siemens 27
The Software House 86
Spacestation Computer Furniture 60
Systems Solutions 73
Tandy 70
?Think Computers 149
University Co-Op Bookshop 66
Warburton Franki 113

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